THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIX. No. 1778.] LONDON, JUNE 8, 1897. [49TH YEAR. PRICE 6d.

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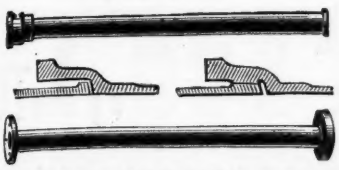
1½ to 12 IN. BORE.



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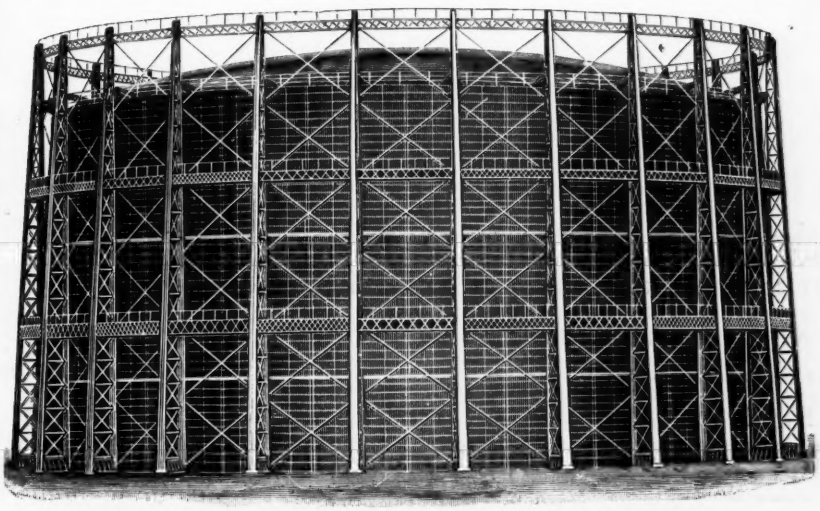

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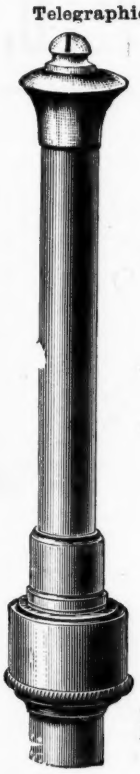

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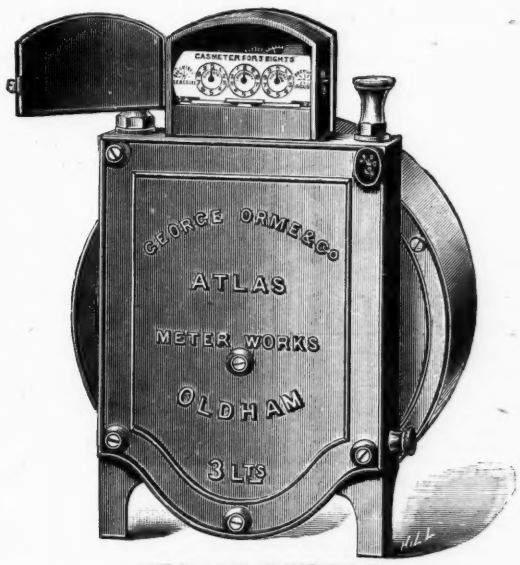

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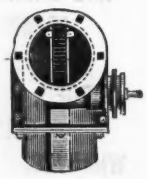

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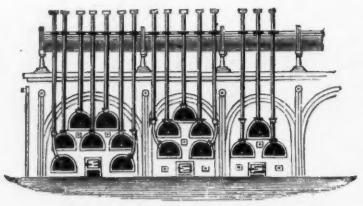

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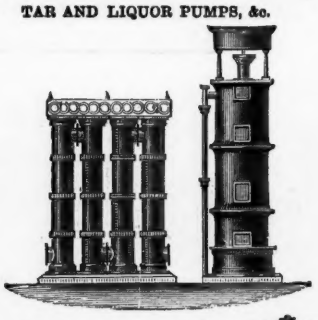

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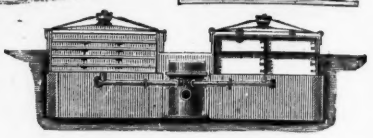

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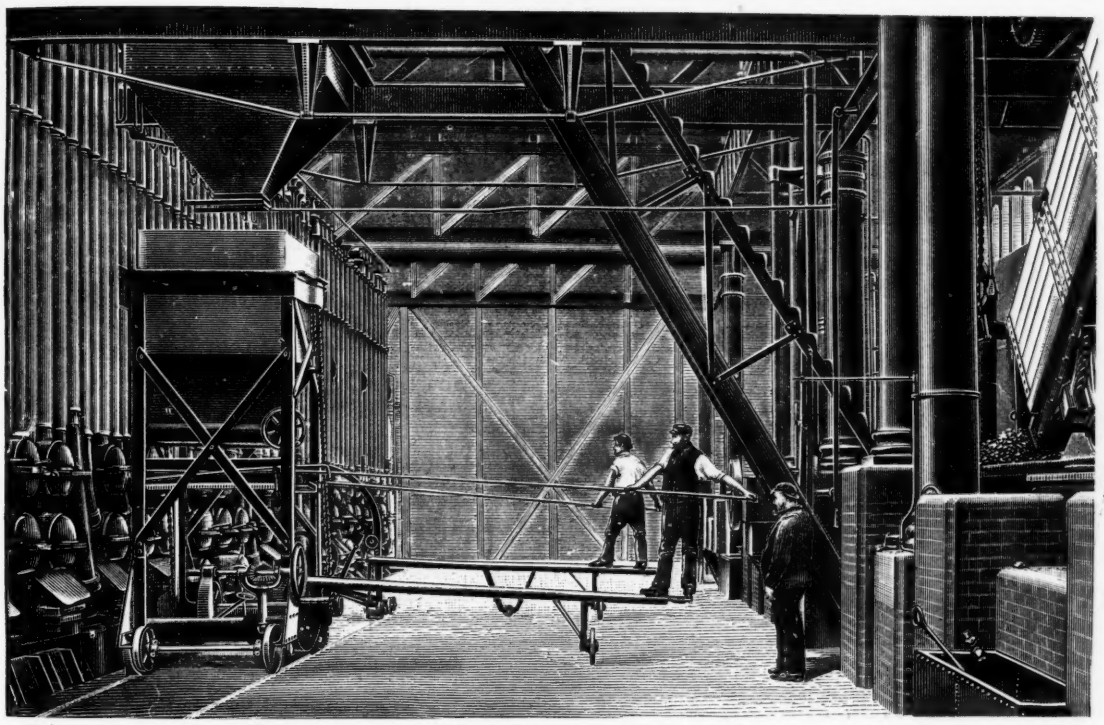

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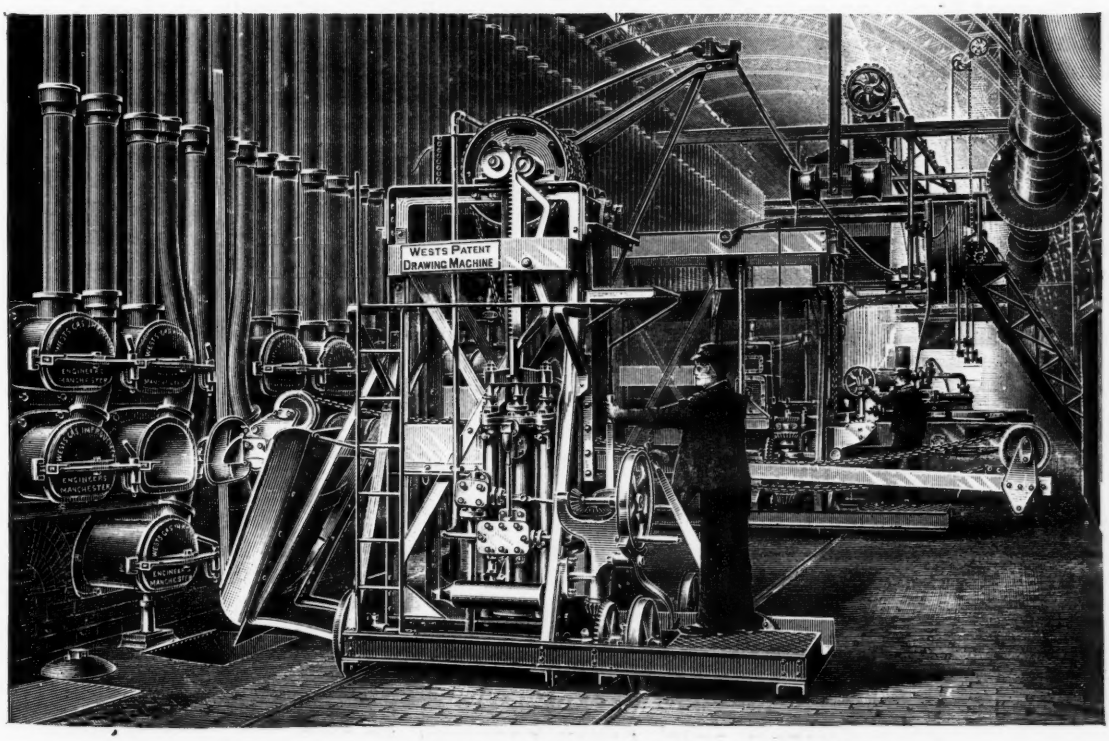

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IMPROVEMENTS IN STREET LIGHTING.

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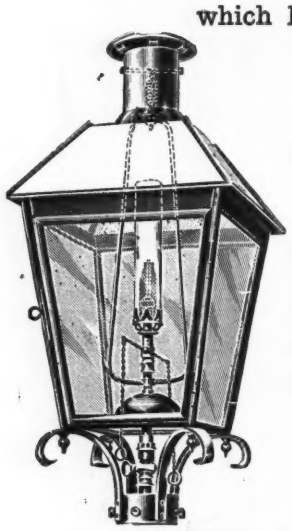
(Welsbach System),

which has now been successfully adapted to the purposes of



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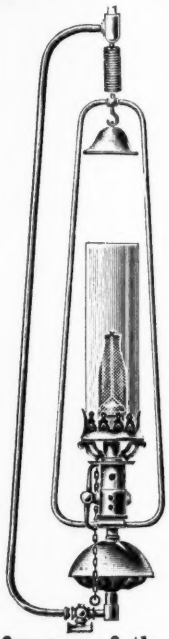
This System of Lighting meets the requirements of all Lighting Authorities in those Districts where it is desired to effect an Improvement in Street Lighting WITHOUT INCREASE OF EXPENDITURE.



The following are Extracts from a PAPER read by Mr. F. G. DEXTER, before the SOUTHERN DISTRICT ASSOCIATION.

"The success of the experimental (Welsbach) lighting secured the contract for one of the Parish Council Districts; and this was shortly followed by the contract for three years for the city lamps. The total represents altogether about 500 single lamps, and 15 refuge lamps containing two lights."

"In the matter of maintenance of the street lights, the record is favourable—in fact, more so than the estimate provided. By the test-meter, the average daily consumption works out to 38 cubic feet per light, including bye-pass. The bye-pass consumes with a flame half an inch long, $\frac{1}{5}$ foot per hour. This represents 1000 cubic feet per lamp per annum. The average consumption per light, when in use, works out to 12,900 feet per annum, or about $3\frac{2}{5}$ feet per light per hour. The lighting is continued all the year round, from the average times of one hour after sunset to one hour before sunrise."

"The mantles have worked out to an average of three per lamp per annum; but, bearing in mind the absence of frost last winter, the writer believes that four mantles per light is more likely to represent average conditions."

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"The number of lights attended to per man averages 85."

"The 'Welsbach' Light is undoubtedly one of the greatest aids to successful competition that the Gas Industry has ever experienced. Its influence, while reducing the relative cost of light, has advanced the consumption of gas all over the country by the increased satisfaction of the existing consumers, and the attraction of others. The writer feels that its influence should not be confined to the house. It is capable of meeting every competitor in the street, from cheap oils to arc lights, in cost and in effect; and it is hoped that the foregoing experience may lead many others to seek its aid and to realize its efficiency."

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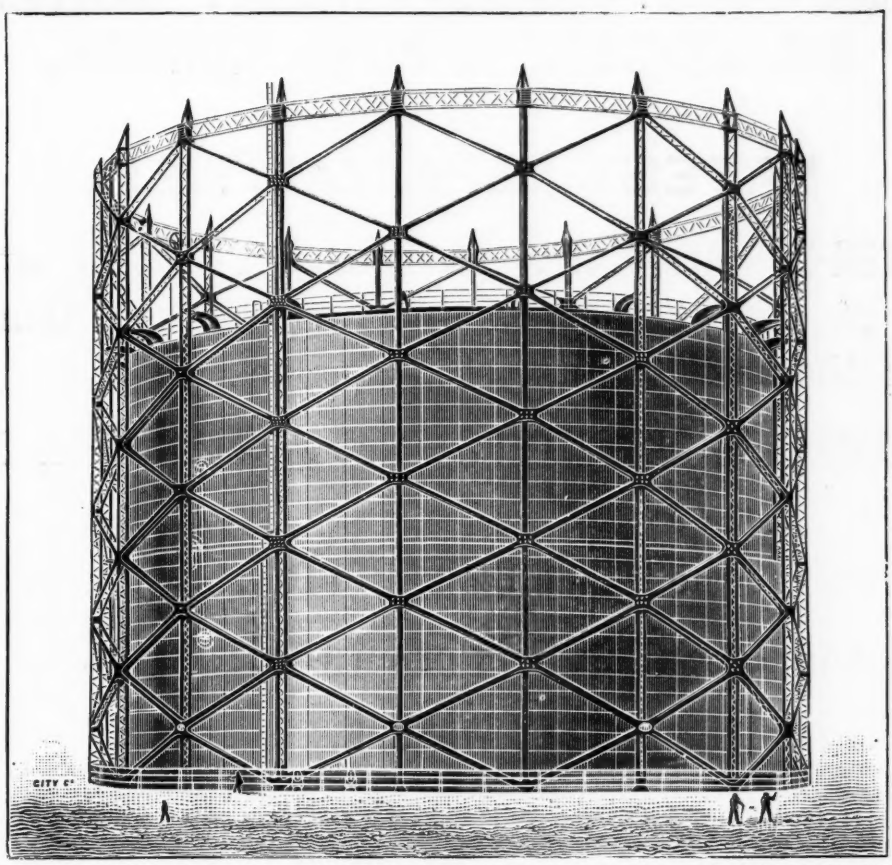

CUTLER'S PATENT GUIDE-FRAMING DOES NOT REQUIRE PIERS FOR ITS SUPPORT, AND THE COST OF THE TANK IS THUS MUCH REDUCED.

It has been adopted at many places, including the following—

Tunbridge Wells	112	by	35	2 Lift	St. Albans	68	by 23 2 Lift
Rochdale	150	„	34	4 „	Jersey	100	„ 30 2 „
Shanklin	60	„	20	2 „	Ipswich	122	„ 32 3 „
Ryde	82	„	25	2 „	Copenhagen	174	„ 30 3 „
St. Mary Cray	78	„	26	2 „	Southend	90	„ 25 2 „
Sunderland	150	„	32	3 „	Hull	82	„ 30 3 „
Hornsey	111	„	35	3 „	Aldershot	82	„ 24 3 „
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Extract from letter from Mr. Winstanley, of Coventry: 'The Condensers you erected for us have been in use some time, and are working very satisfactorily.'

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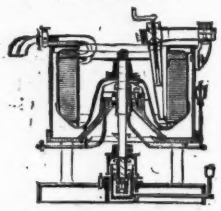

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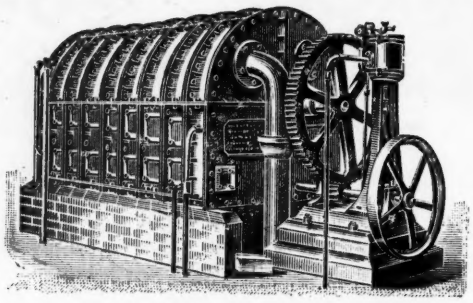

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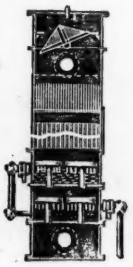

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Brussels (Second Contract)	700,000	Stockport	500,000
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Tottenham	750,000	Lea Bridge	350,000
Tottenham (Second Contract)	750,000	Lea Bridge (Second Contract)	350,000
Santiago	400,000	Guildford	350,000
Swansea	750,000	Stockton-on-Tees	500,000
Manchester	3,000,000	Syracuse, N.Y.	850,000
Brighton	1,750,000	Brentford	1,200,000
Preston	1,500,000	Commercial Gas Co.	850,000
New York	1,200,000	Commercial Gas Co. (Second Contract)	850,000
Southport	750,000	Bridlington	125,000
Bath	1,000,000	Middlesbrough	1,250,000
Newburgh, N.Y.	350,000	Croydon	1,250,000
Newburgh, N.Y. (Second Contract)	250,000	L. & N.W. Railway, Crewe	700,000
Edinburgh	2,000,000	Taunton	225,000
Coventry	600,000	Rotterdam	850,000
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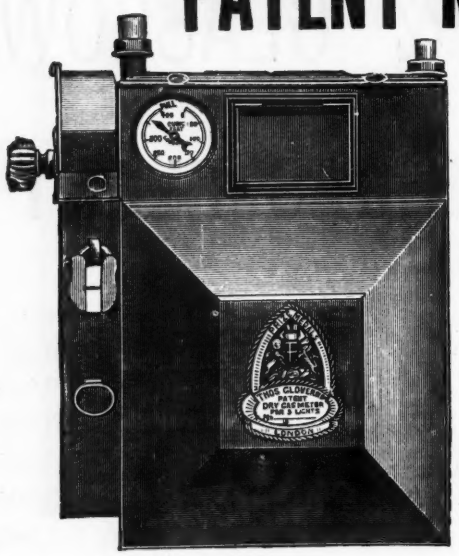

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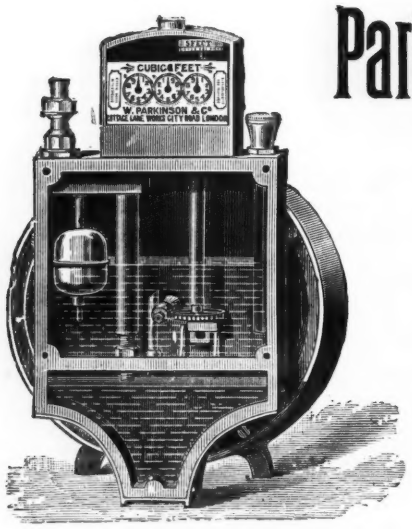

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EDITORIAL NOTES.

The Workmen's Compensation Bill Reported.

THE House of Commons did good work last week in Committee on the Workmen's Compensation Bill, which was duly completed on Friday. The first matters disposed of when the consideration of the Bill was resumed at clause 2 were the proposals of Mr. J. A. Pease and others to include shipyards and canals within the scope of the measure. But the only serious dispute under this head arose upon an amendment moved by Mr. Tennant to make the Bill applicable to employment in workshops. This extension was opposed by the Government on the ground that it would mean a considerable addition to the classes of industry affected by the Bill. The distinction between factories and workshops is one that already exists in law. The Home Secretary cited statistics showing that many more accidents occur in factories than in workshops; and he repeated the Government view that the Bill was to be regarded as an originating rather than an exhaustive scheme of legislation, which is only to be applied in the first instance to the more dangerous trades. Consequently, the House, on the invitation of Mr. Asquith, accepted the position, and with few exceptions abandoned all attempts to discuss the cases of those important categories of workmen who are left outside the present Bill. These exceptions referred to building, power laundries, and warehouses with machinery or plant. The Home Secretary brought up an amendment including "employ-" ment on, in, or about any building exceeding 30 feet in " height which is being constructed or repaired by means " of a scaffolding, or on which machinery driven by steam, " water, or other mechanical power, is being used for the " purpose of the construction or the repair thereof." Of course, the immediate result of this concession was to raise a crop of complaints that the proposed extension did not go far enough. The limitation of the height of buildings to 30 feet was, in particular, denounced as arbitrary. On the other hand, Mr. Bousfield admitted that it was only a question of drawing the line somewhere; and the Home Secretary showed that the stated height was taken from the Act of 1885. Mr. Tennant succeeded in procuring the insertion of the word "demolition" after "construction" in the amendment, which was a distinct improvement. The Home Secretary proposed to include "machinery or plant" after the word "warehouse," which has the effect of bringing under the Bill the operations of loading and unloading by machinery which is part of dock premises or is on a quay. It does not cover the use of ships' tackle for the same purpose. On the motion of the Home Secretary, machine laundries were likewise included. This completed clause 2.

The next controversy arose with reference to the date when the Act should come into operation. The time named in the Bill was the beginning of next year; and Mr. Seton-Karr moved to postpone it for another year, in order to give employers time to make their arrangements for bearing the new responsibilities placed upon them. Other members representing the colliery interests joined in asking for delay; and eventually the Government agreed to postpone the commencement of the Act for another three months. An important clause framed by Mr. Haldane to deal with the difficulty of sub-contracting was accepted by the Government and added to the Bill; the Attorney-General remarking that the lawyers in the House had acted disinterestedly throughout in agreeing to every proposal for the prevention of litigation. The question of bankrupt employers is one of admitted difficulty; and the various problems connected with it have given rise to much discussion. It was agreed that where an employer has insured against the liability created by the Bill and becomes bankrupt, any money he may receive under such insurance shall be attached for the benefit of rightful claimants, and not be included in the general assets. The proposal was also made that compensation payable under the Act should have the like priority as wages in cases of bankruptcy or winding up. But the Attorney-General objected to the amendment as going too far, and it was rejected. An important new clause was added to the Bill at the suggestion of Mr. G. Whiteley,

protecting the owner of premises who is also an employer, and who engages another employer to do work upon the premises that does not come within the scope of the ordinary trade of the owner. In such a case, any claim arising out of the execution of the outside work must be made against the outside employer, and not the owner of the premises. This finished the clauses.

Upon the schedules of the Bill a weighty discussion arose in respect to the amount of compensation payable to workmen of advanced age and variously circumstanced as to dependents. Mr. Chamberlain expressed fear lest the operation of the Act might tend to encourage employers to refuse employment to the older men; observing that he knew many limited liability companies who do not employ men who are more than fifty years of age. Eventually it was decided not to make any distinction with regard to the age of claimants. The familiar difficulty of securing compensation to widows cropped up in due course. Sir A. Hickman proposed to make the widow's dole 10s. per week during life and widowhood; but the Government preferred to stand by the original provision, giving discretionary powers to the Arbitrators, in cases of death, to invest the compensation money in any way they may deem desirable. Mr. Broadhurst observed that no more difficult question could come before the Committee; and he considered it impossible to draw a hard-and-fast line in the matter. One of the most satisfactory features of this discussion was the force it lent to the expectation that in many cases joint committees of employers and workpeople would be formed to work the provisions of the Act. Such committees are obviously the proper authorities to decide the form in which compensation can best be given in particular cases. The discussions on the points of the schedules were extremely instructive and interesting; and we regret that considerations of space prevent our noticing more of this valuable matter, which has to do with the very vitals of British industry. The House of Commons has maintained throughout these debates a high level of public spirit and business capacity, and has apparently been bent upon treating the great Government Bill in the manner appropriate to its quality. This is how the constituencies like to see parliamentary business conducted.

Vindication of the Right of Free Labour.

THE celebrated Trade Union appeal case of *Allen v. Flood and Another* has been advanced a stage in the House of Lords. The facts of the case have been recorded in these columns; but, in view of the protracted and peculiar nature of the legal proceedings, it will be as well to briefly recapitulate them. The work of iron ship repairing on the Thames had been appropriated—of course, without so much as a "with your leave or by your leave" to the employers—by two Trade Unions, styled respectively the United Society of Boilermakers and Iron Shipbuilders, and the Shipwrights' Society of London. The former had its headquarters in Newcastle; being represented in London by a district delegate—the plaintiff Allen in this case. There had been disputes between the two Societies as to the limitations that should be put upon the members' operations; and the north and south country practice in this regard differed. In the North, the practice was for all the ironwork about a ship to be done by the boilermakers—the shipwrights being restricted to woodwork; but generally in the South the shipwrights made and mended ships, whether of iron or wood. There was at Millwall a ship-repairing yard in which the northern practice was observed; and here two men of the Shipwrights' Society, "Flood and another," came to work in April, 1894. They were very soon recognized by some of the Boilermakers' Society as men who had been working in iron on another job; and the former Society men declared that they would strike if these "two-branch "hands" were continued in their employment. Eventually the district delegate was called in; and he told the foreman and manager of the yard that the boilermakers would not work with the shipwrights, with the consequence that the two men were discharged. Thereupon the Shipwrights' Society brought an action against the Boilermakers' officials, which was heard by Mr. Justice Kennedy and a common jury in February, 1895.

The Judge held that the employers had not committed any breach of contract in discharging the two men, because the employment was from day to day, and terminated at the end of the day. He left it to the jury, however, to say whether the defendant Allen (the present appellant) maliciously induced the employer to discharge the plaintiffs from their employment, and whether he maliciously induced the employers not to engage the plaintiffs or either of them. The jury answered both questions in the affirmative, and assessed the damages at £40. The case having been reserved for further consideration, judgment was ultimately entered for the respondents against the defendant for £40 and costs. The defendant appealed, with the result that the appeal was dismissed with costs, on the ground that, the jury having found that he had acted maliciously with the intention of procuring the discharge of the respondents, he was liable in the action, notwithstanding the fact that he had not actually procured a breach of contract. Allen thereupon brought the present appeal to the House of Lords; his contention being that there was no evidence at the trial that he had been guilty of conspiracy, or that he had acted maliciously. It was further argued on his behalf that, inasmuch as the respondents were merely employed on piecework and were paid by measurement, and engaged from day to day, the employment terminating with each day, they had no rights in their employment which the appellant could injure.

The points of law raised were so difficult that the House of Lords, having heard the arguments once, had the case argued again in the presence of eight Judges. After the hearing, which occupied several days, their Lordships put the following question to the Judges: "Assuming the "evidence given by the plaintiffs' witnesses to be correct, "was there any evidence of a cause of action fit to be left "to the jury?" The learned Judges have now given their reply to this question; and, as the result, six of them answer it in the affirmative—that is to say, in favour of the respondents—and two in the negative. Mr. Justice Hawkins, as senior Judge, in his reply treated the issue as that of freedom to labour against irresponsible tyranny. He observed that the respondents were two good workmen who would have been continued in their employment but for the action of the appellant. He declared that in this country every man who honestly endeavours to earn his livelihood by his trade or occupation is entitled to do so free from any molestation or hindrance; and anyone who interferes with him, as the appellant did, without just cause or excuse, does him a wrong which is actionable. The matter now stands adjourned *sine die*, until the House of Lords shall deliver judgment.

The Petroleum Inquiry.

THE evidence taken by the Select Committee on Petroleum continues to be amusingly contradictory on the all-important question of whether or not the flash-point has anything to do with lamp accidents. Some people seem to entertain very violent opinions, not to say prejudices, in this regard, and go to the length of "calling names"—not before the Committee—when they meet with anybody who does not agree with them. At the first meeting of the Committee after the Easter recess, evidence was given by Mr. W. J. Leonard, of Hackney Wick, to the effect that to raise the flash-point of lamp oil would at once bring about a considerable rise in price, the extent and bearing of which could not be estimated. This witness did not believe that raising the flash-point would decrease the number of lamp accidents, which are almost always caused by the fragility and bad construction of the lamps used. He objected to legislation rendering compulsory the distribution and storage of petroleum, on the ground that the effect would be to make the trade a monopoly of the Anglo-American Company, and so drive out of the business independent firms like his own. It is expedient to remark that here we have a competitor with the Standard Oil interest fully agreeing with the latter as to the sufficiency of the legal flash-point. A witness from Ireland testified that his customers preferred American to Scotch oil, and denied that unsafe lamps could be rendered innocuous by raising the flashing-point of the oil. The Chief Officer of the Glasgow Fire Brigade did not think Scotch oil any safer than American. Another Glasgow witness testified to the extent to which American is driving out the native oil in the city shops. In this way the average flash-point of the oil stored and sold had been lowered; but there had been no resultant increase of accidents. These latter were stated to be "all the result of carelessness, frequently "from the upsetting of a lamp by a tipsy man. He only

"knew of one explosion of a lamp, and in that case the "oil was of 83° flashing-point." The witness, who is the Chief Officer in Glasgow under the Petroleum Act, did not think that legislation could give any immunity from lamp accidents, still less that raising the flash-point would add to the public safety. A Liverpool oilman told the Committee that most lamp accidents that were not the outcome of rank carelessness and neglect are due to misfitting wicks. Then came Mr. William Thomson, a Manchester analytical chemist, who sustained the view that, though most of the 160 lamp accidents that had occurred in Manchester during the last five years were the result of "ignorance, carelessness, or intemperance," yet raising the flash-point to 100° would save many lives annually. He thought this could be effected without rendering the oil very much dearer. On the other side, a representative London oilman from Stepney declared that to take this course would almost annihilate the ordinary retail trade without securing any gain in regard to safety. This appeared to be the trade view. Curiously enough, the Manager of a Scotch Oil Company found by experiment that there was no oil in the market to equal Scotch oil for illuminating value, consumption per candle power, or any other practical virtue! Lastly, a fire insurance surveyor gave statistics respecting London fire risks, with special reference to the oil question. He stated that the introduction of mineral oil had tended considerably to increase the number of fires; but none of the serious fires arose from this cause. Hence, though by the use of lamps the number of fires had augmented, it had not materially increased the financial loss. Fatalities occur frequently in connection with small fires, in which the person's clothing only is destroyed. It is doubtful whether the Committee will be able to report this session; but the evidence is concluded.

Kentish Coal.

THE interest of the gas industry of the Southern Counties of England in the newly-found coal-fields of Kent may not at present be great. But the subject is naturally of some technical interest; and it is therefore worth noticing here that the first annual general meeting of the Kent Coal-Fields Syndicate was held on Friday, under the presidency of Mr. G. F. Fry. In the course of his address to the shareholders, the Chairman offered some observations on the character of the "find," for which he claimed great commercial importance. He declared, as regards the Dover coal-field, that its explorers are on equal terms as to cost of mining and working with recognized coal districts. It was also claimed that the quality of the coal is "good"—precisely how good, or by what standard of comparison the valuation has been made, was not allowed to transpire. The Chairman remarked that shareholders had written for information as to whether the seams are capable of profitable working at the depth at which they are found, and also whether it is correct that the seams are too thin for profitable working. The official reply to these inquiries was that a large proportion of the coal raised in England is worked from seams thinner than those at Dover; while many collieries are working at a much greater depth than that at which the Syndicate's coal is found. This answer appears to be candid; but Mr. Fry must not complain if a sceptical world continues to regard the information vouchsafed by the Syndicate as wanting in precision. It is doubtless true that very thin seams of coal are profitably worked in many pits; but a great variety of circumstances require to be taken into consideration before the broad conclusion can be arrived at that what can be done in this particular in one place is equally possible in another. Again, the quality of English coal against which any new source of the mineral will have to compete in the market is very high—at least, a new supply must be prepared to be subjected to the severest tests of quality, reinforced by the powerful influence of existing interests in production, transit, and distribution. The prevailing opinion in technical circles respecting the new Kent coal is that, when it does come into the market, it will be found to belong to the same class as the Belgian article, in which case it will scarcely be able to compete on advantageous terms against the sea-borne supply from the North of England. Time will show. It is only fair to state that the discussion on Kentish coal and its prospects at the recent Engineering Conference was not altogether unfavourable in tone.

WATER AND SANITARY AFFAIRS.

THE New River and the East London Water Bills have been dealt with by the Select Committee of the House of Commons in the manner which is to be expected in the present day. Parliament has escaped from the state of mind in which it was thought right to reject without consideration any project emanating from the London Water Companies; and it is now felt necessary to listen to what the Companies have to say, though with the determination of granting them no more than can be helped. It is felt to be no longer safe to play with the health and comfort of five or six millions of people; but strict care is taken that the Companies shall gain as little as possible, if anything at all, by the powers given them for the public benefit. Mr. Pember, on behalf of the New River Company, pleaded before the Select Committee that the sinking fund plan was no longer applicable. By the appointment of the Royal Commission, purchase had ceased to be a foregone conclusion, and was to be treated as a matter of discussion. Whatever may be said as to this view of the situation, there was considerable force in the argument that the sinking fund clause should be inoperative unless purchase actually took place. The scheme of a sinking fund was unquestionably established as a preliminary to the purchase of the water undertakings. Nothing else could justify the enforcement of such a system; and it is a curious problem as to what will become of the sinking fund if the Companies are to retain possession of their property. The purchase question has clearly drifted back from the prominent position it once occupied; and should the Royal Commission pronounce against it, its disappearance will become inevitable. But the sinking fund clause forms part of the Staines Reservoirs Act of last year; and this has given the Select Committee a hold on that untoward device—the preamble of the New River Bill being passed on the condition that a sinking fund clause shall be introduced into the measure. It is a curious feature of the Bill that, unless it passes, the New River Company will be unable to draw a drop of water from the Staines reservoirs, though the Company formed one of the three who promoted the Staines Bill. A million of money is now wanted to correct this omission. It was thought that the mains of the two other Companies concerned in the scheme could be made to convey the supply to the New River area; but it was ultimately found the existing pipes had enough to do as it was. It looks as if the scheme was starved at the outset, lest Parliament should be startled at the amount of capital required. But there can be no denial now, unless there is to be a water famine in the New River district before ten years have passed away. According to the evidence given by Mr. Searle, the Company's Secretary, the Company are already at the limit of their supply, and can only meet the maximum demand by drawing upon their storage. With three or four miles of extra mains going down every year, there is urgent reason why the Company should actually obtain the water which the Act of last session was suppose to give them.

The East London Bill proposes a less extensive outlay than that of the New River Company. The scheme, to cost half a million, is chiefly one of storage—catching the water of the Lea at times of flood, so as not to diminish the minimum flow. The proposed works include a new main, by which an increased head of water will be given in a part of the district where it will be of particular value. The Committee were warned that the scheme is but an instalment of what is required to carry out the recommendations of the late Royal Commission. In this sense, Sir Frederick Bramwell gave evidence in support of the Bill, which he described as embodying the best plan with which he was acquainted for both the river and the population to be supplied. Concerning the sinking fund clause, Sir Frederick said that, if this were to be inserted in the Bill, it certainly seemed to him that payment to the fund should be deferred until after the works came to be used. This arrangement was agreed to by the Committee in regard to both the East London and the New River Bills. But the chief fight during the proceedings seems to have been with regard to land rather than water; Mr. Shaw Lefevre and a considerable number of witnesses seeking to remove the site of the proposed reservoirs, so as to retain certain Lammas lands intact, unless an equivalent area was provided elsewhere. The Committee settled this question by passing the preamble of the Bill on condition that the

Company assigned 25 acres of land to the Local Authority for recreation purposes; this space being either taken from the area of the proposed reservoirs or acquired elsewhere in the neighbourhood. This is not the first time that the East London Company have been beset by some difficulty of this kind—a dispute respecting Lammas lands arising in 1893 in connection with the works they were then engaged in carrying out. Opposition was then conciliated by an agreement which the Company entered into, but which does not appear to govern the present circumstances. As an *addendum* to the subject of the East London Water Bill, we may observe that the attempt on the part of the Progressives to influence the Vestry elections by partisan appeals respecting the water famine, appears to have resulted in failure.

A third Bill before the Committee was a measure of a temporary nature, by which the Southwark and Vauxhall Water Company asked Parliament to legalize until next year the extra draught of water which the Company found necessary to take from the Thames in order to meet the wants of the district. This proposal was vehemently opposed by the London County Council; but the Committee resolutely refused to accept the responsibility of a water famine; and they declared the preamble of the Bill proved, despite a couple of protests that the opposition had not been fully heard.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1313.)

THE past week on the Stock Exchange has been one of the quietest possible. Serious business pretty nearly closed with the conclusion of the settlement the week before; and its successor found itself heavily handicapped by the counter-attractions of Epsom, followed by a closed Saturday and the Whitsuntide recess. The markets have, therefore, been very quiet all round. Movements are so slight as to present no feature of importance; but they were somewhat irregular. Special causes elevated some lines, while others drooped from inaction. The gilt-edged class did well, as abundant money came to the front for investment. In the Gas Market, business opened fairly brisk, considering the general quiet of the time. But it soon died away to very small proportions; and transactions were of the lightest. The general tendency, however, was excellent, and prices of all descriptions held very firm; while several quotations made moderate improvements on their previous figures, and none underwent any reduction. In Gaslights, the "A" was fairly active; and movements showed a good disposition. Opening at 313, it gradually hardened up to 315½, and closed steady. But the quotation was left unchanged. South Metropolitan continued quite destitute of feature, changing hands steadily at about middle figures. The debenture stock, however, was raised, though no business was marked in it. Nothing to speak of was done in Commercials; but the quotation was advanced. Hardly a transaction was effected among the Suburban and Provincial division; and their prices underwent no revision. The Continental group were mostly quiet, though a fair amount was done in Imperial. The price kept very steady, and closed as good as anything in the week. Tuscan debentures had a little rise. Among the rest, Melbourne bonds were rather harder; and Chicago seconds gained a point on *ex div.* marking. The Water Companies developed some activity, with a favourable tendency; and Grand Junction, Lambeth, Southwark, and West Middlesex had a slight rise.

The daily operations were: Business in Gas was moderate on Monday; but prices looked up. Both Commercial advanced 2; Melbourne bonds, 1; and Tuscan debentures, 1½. In Water, West Middlesex rose 2; and Grand Junction and Lambeth tens, 1 each. Gas stocks were busier on Tuesday; but prices did not move. West Middlesex Water gained 1 more. Wednesday's transactions in Gas were lighter; but prices remained very firm. Southwark Water rose 1. Business on Thursday was much the same; and quotations were not varied. On Friday, there was a shade more activity, with continuing firmness. South Metropolitan debentures moved up 1½. Saturday was a holiday.

ELECTRIC LIGHTING MEMORANDA.

The Affairs of the London Electric Supply Corporation—The Future of the Deptford Station—A Disappointment—Power Transmission.

IT is some time since anything was published concerning the affairs of the London Electric Supply Corporation, whose pioneer station at Deptford and other property of every description passed into a Receiver's hands in July, 1894. The concern was taken possession of at this period by Lord Wantage, as debenture-holder, the condition of the Company being at the time desperate. Immediately after the appointment of the Receiver, the accounts were made up to the end of the first half of the year; and they showed a loss of £3484 on the working. Lord Wantage's claim was for £80,000; and there was due to other creditors £15,370. If the debenture-holder had not stepped in, the whole concern would have been sacrificed for a song. He very generously took the undertaking in hand, thereby incurring great additional responsibility, and saved the future for the shareholders. In his efforts on behalf of the Corporation, Lord Wantage has been ably seconded by the Receiver, Mr. R. Stewart Bain, and the Chief Engineer, Mr. d'Alton. The difficulties, financial and technical, which these officers have had to contend with during these three years have been very considerable. Without money and with very little business to go on with, and with plant calculated rather with reference to an unrealized grandeur than with regard to actual requirements, the prospects of the Corporation three years ago were gloomy in the extreme. Work went on, however, and some new capital was found to supply what was lacking in the plant. Additional business was secured—not without some adventure in the line of rate-cutting; and thus the original lamp connection of 67,691 has been increased to 113,584. Rate-cutting competition has ceased since 1895; and the Corporation have been brought into relations of a different kind with several of the other Metropolitan electricity supply companies. The management now contemplate, with legitimate hopefulness, a future of supplying electrical energy in bulk to the inland undertakings, several of these being so situated as to be unable to extend their generating stations.

This branch of business appears so obviously as the very thing that the Deptford establishment is cut out for, that it is somewhat surprising to find it mentioned as a novelty in the statement made by Lord Wantage at the meeting of shareholders of the Corporation last Tuesday—the first that had been called since the receivership. One is accustomed to hear a great deal about the electrical transmission of power in distant places and for all manner of strange purposes; yet in discussions of this subject the existence of the Deptford power factory is generally overlooked. Here, in a most favourable position on the tideway of the Thames, with connections running into the heart of London, is established a station specially intended for, and adapted to, the generation and transmission in the best possible manner of high-voltage electricity. Why is it not better employed? It is at least excusable to argue that until the wholesale supply of current from this station is both a technical and commercial success, a good deal of the talk about the advantage of the transmission of power by the agency of electricity must be heavily discounted. If there is so much in this method as is pretended, should there not be work enough not merely for one but for many river-side generating stations as big as the Deptford one, without the owners experiencing the necessity for doing any lighting on their own account? A beginning is to be made with the supply of electricity in bulk, if the term is permissible, from Deptford to the station of the Chelsea Company; and if it does not pay the latter Company better to get current thus than to produce it from coal carted through the streets in bags, there cannot be much in the electrical transmission of power.

With regard to the question of how far it is commercially possible to distribute power electrically, which most people ask as soon as their attention is directed to the subject, it is to be noted that Professor George Forbes thinks the inquiry rather irrelevant. This opinion seems to have been formed with reference to the change that has come over the aspect of the Niagara power utilization and transmission scheme. The general impression in regard to this much-advertised scheme certainly was that it was meant to make the distant desert blossom like the rose, so to speak, by the aid of power distributed electrically from the station near the Falls. Now it appears that this idea is all wrong, and that the course of development actually being taken is for the location of power-using factories at no great distance from the generating house. Consequently, Niagara might as well almost have remained unbridled, for all the proof it is going to give of how far it pays to distribute power electrically in competition with coal from a bag. This is a disappointment of many hopes of different origins, and confirms the discouraging lesson of the factory at the Falls of Foyers. There are innumerable natural sources of power scattered up and down over the face of the earth; but in the majority of instances these are not suitably situated with regard to the convenience of industrial mankind. Everybody has known for a long time of the enormous power running to waste at Niagara and other cataracts; and when the electricians began to boast of their ability to put these waste energies of Nature to useful work, it was always with the understanding that they could take the power to the place where it was wanted. It is a very different thing to tell us now that it is better to bring the factory to the power. There is no particular victory for electricity in this.

This subject of power transmission is very much to the fore at the present time. Hitherto the problem has only been attacked incidentally, and it has been the general practice to generate the power where it was needed for use, though the moment a motor engine is made to drive another machine there is a transmission of power. In many factories the last driving-pulley is a long way, both topographically and mechanically, from the source of power. The tendency of modern engineering

practice is to reconsider all such arrangements. The long shafts and the multitudinous belts have first given place to the steam-pipe led to an independent engine; and this is now being superseded by the hydraulic power tube and the electric main. There is probably more room at the present time for this, as it might be called, secondary or minor power distribution by electricity than there is for the wholesale transmission of power by similar means. It must not be forgotten, however—as very nearly happened at the recent Engineering Conference—that the gas-pipe is a formidable competitor with all existing systems of power transmission. Moreover, this system of power transmission occupies a field of its own, between the largest scale upon which the operation can be carried on, and the purely localized distribution which seems to suit electricity best. A very great deal of the work of the world is done by units of power of medium size, situated in the midst of the most densely populated town areas, and not favoured with immediate access by rail or navigable stream. When man wishes to make calcium carbide or aluminium, he can betake himself to the cataracts of the rivers that run among the hills. and spoil the picturesque landscape in the interest of electro-chemical industry. But when he wants to make boots and shoes, he sets up his business in a street in some busy quarter, and tends to rely more and more upon the gas-main for his power. If he is a dentist, and has a dental engine to work, it pays him to get a connection with the local electricity supply—to say nothing of the uses of advertisement.

CONCERNING CARBURETTED WATER GAS.

A good deal of very interesting and important information concerning the facts and prospects of carburetted water-gas manufacture in Great Britain came out in the discussion upon the subject at the recent Engineering Conference. It would not be misrepresenting the broad result of the discussion, to say it left both the economical and the technical questions open—that is to say, it did not establish any general rule as to when and where carburetted water gas might be advantageously introduced into British gas-works; nor did it prove the existence of a consensus of authoritative opinion as to the best way of making this kind of illuminating gas. It is permissible to state here what could not be fittingly mentioned in the Conference—that British gas managers have actually at command two or three commercially-developed systems of carburetted water-gas manufacture between which there is, technically speaking, not a great deal to choose. They are all based on the Lowe principle of generator, carburetter, and superheater; and they are worked in much the same way, and utilize the same materials—coke and heavy oil. Mr. Corbet Woodall has stated that neither the specific gravity nor the flashing point of the oil makes any material difference in the carburetting results; and Mr. Charles Hunt has observed that a carburetting duty of 7 candles per gallon per 1000 cubic feet is a fair working standard. The consumption of coke is a point of less importance; but this may be taken at rather less than 45 lbs. per 1000 cubic feet. These points appear to be already fairly settled; but thereafter differences arise.

The first practical question that is pretty strongly disputed is that of the most expedient standard of illuminating power to which a plant of this class should be worked. An average of 20 or 21 candles has been accepted in the majority of English gas-works where the system has been adopted, principally because the plant gives least trouble when worked under this condition. Mr. Frank Livesey alluded at the Conference to the essentially fluctuating method by which these plants work. One might, indeed, borrow a term from electrical engineering for the Lowe process, and call it the alternating system of carburetted water-gas production. This alternation is admitted to be an evil. In the early days of the Lowe process, in the United States, the periods of alternation were long. Twenty minutes' blowing up, and a quarter-of-an-hour's gas making were not considered bad practice; but one of the points of improved working that have been introduced of late years into the system has been the reduction of the periods of alternation, until they are now as short as is permitted by consideration of the possibilities of manipulation. Even so, however, absolute uniformity in the results is not always possible of attainment, or of maintenance over a long time. It is not always that the fire is in a fit state to stand three and four-minute alternations of blowing up and gas making. Automatic reversals cannot, therefore, be resorted to with safety; and it is consequently necessary to rely for a good deal upon the judgment and faithfulness of the attendant, who is constantly at his peril, as Mr. Livesey put it, between making lamp-black and tar. It is impossible to regard as wholly satisfactory a manufacturing process subject to such hazards, and so dependent upon the fallible human agent. Of course, notwithstanding this drawback, the plant answers its purpose, and can be trusted to satisfy the terms of the makers' guarantee. It is, in point of fact, just good enough; but it is far from being perfect.

Nor is it easy to perceive how the working can be improved, so long as the alternating system is adhered to. As Mr. Woodall truly stated, it is more economical to make a richer carburetted water gas than the ordinary work-a-day 20 or 21 candle gas; but this way lie troubles of various kinds. All other things being equal, it is obviously more hazardous to increase the dose of oil in a plant that oscillates continually between two limits of efficiency in dealing with any oil at all. Mr. Foulis has made carburetted water gas by the alternating process up to 50-candle power; but he did not continue doing so for long. When he had come thus far he took yet another step and crossed the boundary—abandoning both water gas and alternations for the pure and simple carburetting oil gas. This admission on the part of Mr. Foulis served to raise the question as to the validity of the alternating system *per se*, as some people are so fond of saying. Mr. Woodall ventured to state that, although another system is yet in operation in a number of places unnamed, where water gas is made by itself and subsequently carburetted by the addition of oil gas also made separately, "these processes are all doomed." Is this so? Let us briefly ascertain what elements must be taken into account in satisfying this inquiry.

In the first place, it cannot be contended that by the Lowe process plain water gas can be better made than in a plant specially adapted to the purpose. We are not going to say that the possibilities of water gas production have been exhausted in the Tessié du Motay plant still used by the Municipal Gas Company of New York. It may be, as Mr. Woodall observes, that in some places where plant of this type still exists in the States, it is only used "because it is there." But there is another view of the facts; and there are those who will aver that this plant is at least as good as anything that could be found to take its place. It is, at any rate, conceivable that the manufacture of plain water-gas might be susceptible of improvement, if the complication of carburetting were taken away from it. The alternating principle is inseparable from the production of plain water gas; but, if it were not necessary to think of the carburetting duty, mechanical stoking, automatic alternating, hot-blast blowing, and one or two other matters might be brought into connection with the process. All the vaunted advantages of a subsidiary carburetted water gas would be just as available under an improved separate system as with the Lowe plant. The generators would be just as handy for making gas quickly on an emergency; and they would be just as efficient in disposing of surplus coke. It is admitted on all hands that oil treated by the Young and Bell system is a more economical carburetting agent than the same material when "scrubbed," as Mr. Foulis described the Lowe method, "through a network of hot bricks." What the technical world does not know is how efficiently separately-made water gas can carry high-quality oil gas. There also remains the question of ground space required for the various systems.

We refrain from importing calculations of comparative cost into these reflections, because we intend no more than to "introduce" the investigation, as the subjects were stated to be introduced at the Conference, and leave it for those of our readers who are interested to carry the inquiry further. Nothing was more remarkable in the Conference discussion than the slenderness of the indications offered—they could not be called proofs—that the manufacture of carburetted water gas carries with it any notable economic advantage. Mr. Foulis and Mr. F. Livesey were very incisive in this regard; and Mr. George Livesey allowed it to be seen that, in his opinion, some of the chief advantages of auxiliary carburetted water-gas plant for British gas-works are rather consequential than direct, while it is necessary to test every suggestion for its adoption on its local merits—which may, of course, in certain cases be great.

Here, therefore, we will leave the topic for the present; reiterating the observation that the recent Conference debate left open the questions of when and where the adoption of carburetted water gas would be expedient as an auxiliary to coal-gas manufacture in this country, and how it can best be produced. Many answers might be found for all these questions, as well as for others that might be raised in connection with the general subject and upon the points of detail touched by the discussion. But it will be better to avoid all subsidiary issues.

PERSONAL.

Mr. S. Y. Shoubridge, the successor to Mr. C. Gandon at the Crystal Palace District Gas-Works, took up his duties there last Tuesday.

Mr. J. O. Pask, on resigning his position as Manager of the Bungay (Suffolk) Gas-Works, noticed last week, has been presented by the townspeople with a purse of gold.

Mr. W. Laurence, J.P., who is well known as an active Director of the Maidstone Gas and Water Companies, has had the honorary freedom of the borough of Maidstone presented to him in a silver casket, in recognition of the services he has rendered to the borough by taking part in the local government for a period of more than fifty years.

Mr. J. Parkinson, who holds the dual position of Town Clerk of Brighouse and Manager of the Corporation Gas-Works, has recently received an addition of £50 a year to his salary. Though no change has been made in Mr. Parkinson's remuneration since the Corporation came into existence, the proposal to recognize his services in the above-named way was objected to by four members of the Town Council. They were, however, overweighted by the twenty-three who supported it.

NOTES.

Donkin on Uniform Tests for Engines and Boilers.

At the recent Engineering Conference, Mr. Bryan Donkin brought forward the subject of the economic working of steam engines and boilers, and offered the suggestion that the results of all steam engine and boiler experiments should be tabulated in a uniform manner. There is now much confusion in regard to this matter, as experimental data are published in various ways, and under different headings by the different authorities. Mr. Donkin asked for the co-operation of the Council of the Institution of Civil Engineers in procuring this very desirable uniformity; and he suggested that a small Committee should be appointed with a view to determining the best set of headings for the detailed statement of results. Such a standard method would unquestionably be found very useful for a more rapid and accurate comparison of experiments. The proposed form should be as practical and simple as possible. This has already been done in the United States, where experiments are now nearly always published in accordance with the uniform system of headings recommended and adopted by the American Institution of Mechanical Engineers. Any additions can be made by any experimenter, at the end of the standard form, to suit special requirements. This suggestion derives additional point from the numerous improvements introduced of late years in boiler and steam-engine design, which combine to render the old term "nominal horse power" valueless as a standard of comparison. It is expedient, in most cases, to obtain a guarantee of actual performance.

A Novel Property of Carbon.

Mr. A. C. C. Swinton has continued his exploration of the character of X and cathode rays; and at the recent Royal Society *conversazione*, the place of honour was given to his experiments. Hitherto the usual method of investigating the character of cathode ray discharges, apart from their mechanical properties, and beyond what is visible to the unassisted eye, has been by allowing the rays to fall upon a screen of some brightly fluorescent material. Mr. Swinton has found that, by replacing the usual screen with one made of ordinary electric light carbon, much appears which was previously invisible. When a concentrated stream of powerful cathode rays is focussed upon a surface of carbon in this manner, a very brilliant and distinctly defined luminescent spot appears on the surface of the carbon at the point of impact of the rays; the rest of the carbon remaining black. This luminescent spot seems to have a very close relation to the fluorescent spots on glass and on other fluorescent substances under similar influence. The effect is entirely on the surface, as when the cathode stream is rapidly deflected by means of a magnet, the luminescent spot on the carbon moves with no perceptible lag. Further, though, as also in the case of glass, the whole of the carbon becomes heated to a considerable extent if much power be employed for a long period of time, these luminescent spots are instantaneously produced of very considerable brilliancy on carbon with but a comparatively low power. Again, just as glass is known to become fatigued under the influence of cathode rays, so that after a time it refuses to fluoresce so brightly as before, so carbon becomes similarly fatigued, although only after having been very strongly acted upon. Carbon, like glass, recovers its property of giving surface luminescence to some extent, but does not seem to entirely recover—at least, not rapidly. The tube in which these phenomena are shown must be kept connected with the pump, because the vacuum is rapidly reduced by the hydrocarbons given off by the carbon under this influence. This behaviour of carbon is very remarkable and suggestive.

A New Source of Sulphate of Ammonia Manure.

At the last conference of Municipal and County Engineers, another possible source of sulphate of ammonia was revealed in a paper by Mr. Herbert Jones, the Medical Officer of Health, at Crewe, upon a method of treating crude night soil with acidulated ashes. The author gave an account of a novel method of disposing of crude house sewage in towns where water carriage is only partially prevalent, and where pail-closets or cesspool privies are in use. There are a large number of towns where the disposal of this material by the usual methods of carting away or reduction to poudrette is inapplicable. Crewe is such a place; and here for the last eighteen months a system has been adopted which is declared to have proved satisfactory, both to the neighbouring farmers and to the sanitary officials. Dry-ash closets are largely used, emptied once a fortnight. The dry ashes are first screened; and the finer portions are then sprinkled by means of a watering-can with commercial sulphuric acid, in the proportion of about 4 per cent. by weight. The acidulated ashes are then formed into a rectangular bay, 10 feet by 6 feet, with walls 18 inches high, and a bottom of the same thickness. Into this bay, the contents of the house-pails are emptied during the night, in about equal proportions by weight. The following day the mixture is well worked with a long rake; the volatile carbonate being converted by the sulphuric acid into the more stable sulphate of ammonia. There is stated to be almost an entire absence of smell about this process. But those who have had to do with the manufacture of sulphate of ammonia by the ordinary systems, may well be sceptical on this point; and in this regard, the admission that the compounding of the mixture is done by night is significant. At any rate, if such a process should be copied in the vicinity of gas-works, it would require to be assiduously watched with reference to the question of nuisance.

Steel Chimney Construction.

An interesting example of tall chimney construction in steel is supplied by the Cleveland Electric Illuminating Company of Ohio, who have erected a shaft claimed to be the tallest of its kind in the United States. It is 225 ft. 1¾ in. high from the bottom of the base-plate to the top of the summit angle iron, with a clear diameter throughout of 11 ft. 6 in. inside the brick lining. The height of the shaft was determined by the character of the situation; the works being in a valley, and the surrounding hills covered with buildings. The foundation was poor, and had to be piled. Upon the piles 12 feet of solid masonry was built in hydraulic cement, through which the holding-down bolts passed to be secured to the piling. The base of the stack proper is a heavy cast-iron curb, which takes the nuts of the holding-down bolts. To the curb, which is 25 ft. 4 in. diameter outside, is riveted the first tier of $\frac{7}{16}$-inch steel plates. For the first 25 feet in height, the shell is double riveted and is bell-shaped; the outside diameter at this height being 15 ft. 4 in. From this level, the shaft tapers to the top, where it is 12 ft. 2 in. diameter, and the plates are reduced to ¼ inch thick. After the height of 25 feet, all the horizontal seams are single riveted, and the vertical seams from 65 feet. The total weight of the steel and cast iron used in the structure is 125 tons. The brick lining starts 21 inches and reduces to 4½ inches at the top. This stack was erected for the most part during high winds, by means of inside scaffolding and outside stages. The steel work was entirely completed, and the staging removed, before any brick lining was put in. Notwithstanding the stormy weather, no trouble was experienced from any undue swaying of the stack, which has so far stood well. The details of the construction are published in the "Engineering Record."

Oil Lighting by Constant Supply.—We learn that a Syndicate is being privately formed, with a capital of £15,000 in £1 shares, to acquire and develop the patent rights in the Reynolds-Astley system of lighting by a constant supply of petroleum, an exhibition of which was recently given at the Royal Institution.

The Position of Sulphate of Ammonia.—The Huddersfield Gas Committee have, upon the recommendation of their Engineer and Manager (Mr. E. A. Harman), agreed to join the Sulphate of Ammonia Association in connection with the movement recently initiated for resuscitating the sulphate market.

The Automatic Gas-Retort Litigation.—We learn from the Town Clerk of Salford (Mr. S. Brown) that he is giving notice of appeal from the decision of Mr. Justice Romer in the action brought by the Automatic Coal-Gas Retort Company, Limited, against the Salford Corporation, which was tried in March last (see *ante*, pp. 663, 722).

Books Received.—"Experiments on Steam-Boilers." By Bryan Donkin, M.Inst.C.E., M.Inst.M.E., and A. B. W. Kennedy, LL.D., F.R.S., &c. Edited by Bryan Donkin. Reprinted from "Engineering." (London: "Engineering" Office, Bedford Street, W.C.) "The Transactions of the Society of Engineers for 1896," with a General Index from 1857 to 1896. Edited by G. A. Pryce Cuxson, Secretary. (London: E. and F. N. Spon, Limited, 125, Strand.)

Acetone as a Solvent of Acetylene.—In a recent number of the "Comptes Rendus," MM. Berthelot and Vieille gave an account of their experiments on the value of acetone as a good solvent for acetylene. After examining the relations between pressure and temperature for solutions of various strengths, they studied the effects produced by exploding a small charge of mercury fulminate, and by a red-hot wire. It was found that solutions of acetylene in acetone, though still capable of explosion, were much safer than the gas alone; the pressure at which explosion began to be possible being raised from 2 to 10 kilogrammes per square centimetre. For a given sized vessel, the quantity of acetylene that can be safely stored is fifty times greater with acetone than without it.

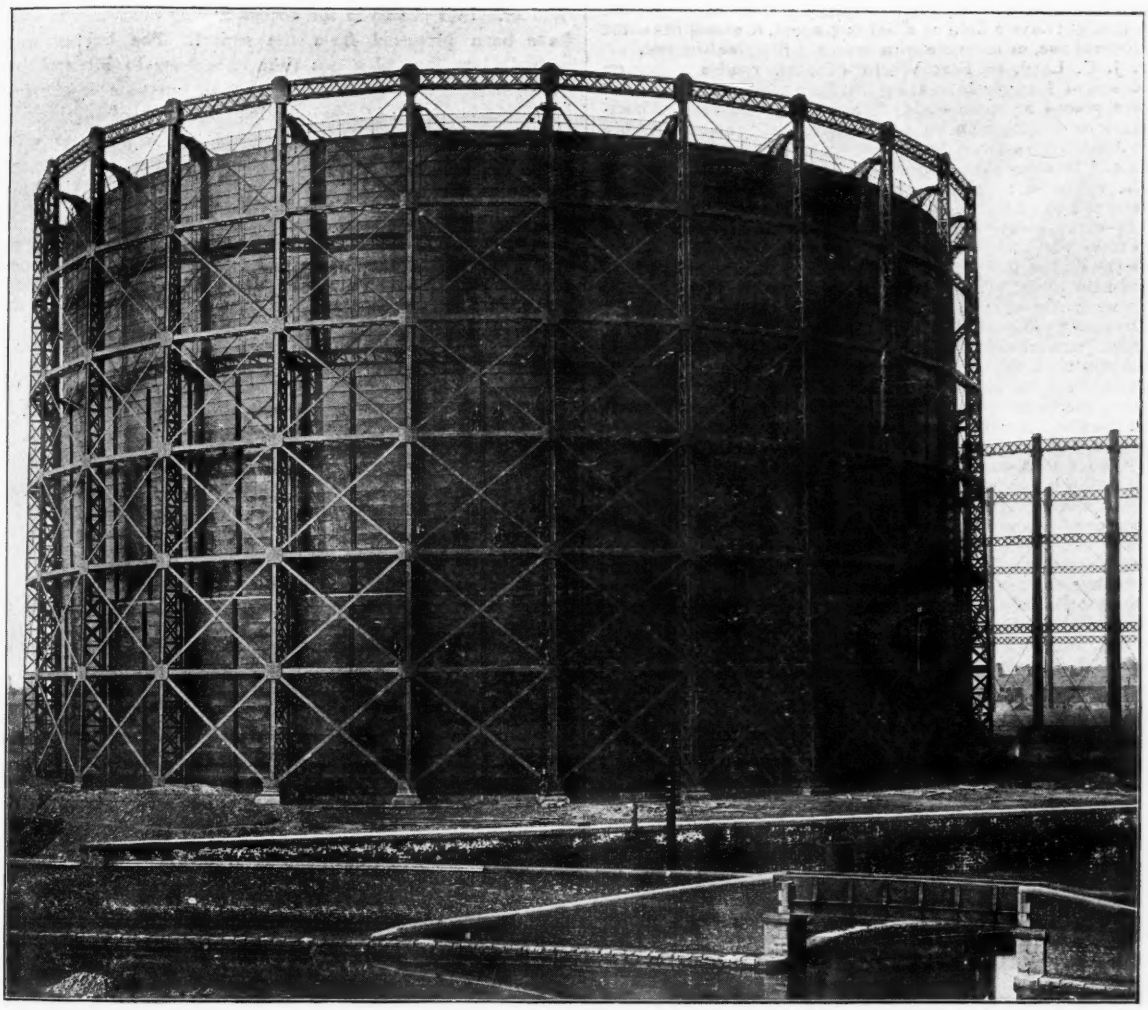
The Visit of Engineers to the London Water Companies' Riverside Works.—The President and Secretary of the Institution of Civil Engineers have conveyed to Mr. Walter Hunter, M.Inst.C.E., the Engineering Director of the Grand Junction Water Company, to whose efforts the success of the above-mentioned visit was largely due, the Council's appreciation of the kindness and hospitality displayed by the Directors of the Water Companies and Messrs. John Aird and Sons on that occasion; and they have asked him to intimate this, and to accept their thanks for the trouble he personally took in the matter. In acknowledging the letter, Mr. Hunter said he knew it would be gratifying to the Directors and Messrs. Aird to receive this assurance that the visit was both interesting and pleasant; and, on their behalf, he expressed the pleasure it had afforded them to promote in any way the success of a conference of members of a profession with which they are so intimately connected. In noticing the visit last week, it should have been stated that the expenses of the excursion were borne by the Directors and Messrs. Aird conjointly.

TECHNICAL RECORD.

THE LARGE TREBLE-LIFT GASHOLDER AT THE BRADFORD ROAD GAS-WORKS, MANCHESTER.

The erection of the large treble-lift gasholder at the Bradford Road Gas-Works of the Manchester Corporation, of which we give an illustration below, was commenced in the early part of last year; and it has quite recently been brought into use, after having been twice tested to its full height with air. Its dimensions are: Outer lift, 250 feet diameter and 50 feet deep; middle lift, 247 feet diameter and 50 feet deep; inner lift, 244 feet diameter and 50 ft. 6 in. deep. The holder and guide-framing are, with the exception of the cast-iron base-plates to the standards, built entirely of steel. The crown of the holder rises 20 feet. It is composed of three outer consecutive rings of plates, their thickness being $\frac{3}{4}$ inch, $\frac{1}{2}$ inch, and $\frac{1}{4}$ inch respectively, and sheeting of No. 9 B.W.G. thickness, in rectangular sheets 6 feet long and 3 feet wide, arranged in the manner first adopted by Mr. George Livesey in the construction of the Old Kent Road gasholder. The side sheeting consists of plates measuring from $13\frac{3}{4}$ to $14\frac{1}{4}$ feet in length and 3 feet in depth—the plates stretching from one vertical stay to the next without break. There are in the inner lift 56 vertical stays made of $\frac{3}{8}$ inch plate and angles; and at the back of these stays vertical strips 18 inches wide are inserted in the side sheeting. To these strips the long side plates are attached. There are therefore no vertical joints except those at the two edges of each strip. The same plan is followed in the middle and outer lifts; the internal guides being riveted to the vertical strips, and external stays, composed of bulb angles, being placed on the outside of the strips.

The cups and dips are 24 inches deep and 12 inches wide, made of $\frac{1}{2}$-inch plates, on Piggott's system. The bottom curb of the outer lift is of unusual strength. It consists of a bottom flange 12 inches wide and $\frac{3}{4}$ inch thick, secured by angles to a bottom row of plates, $\frac{1}{2}$ inch thick; and in addition to this there is an 8 in. by $3\frac{1}{2}$ in. steel channel, set edgewise against



the bottom row of plates 15 inches above the bottom flange. Between these are fixed 56 roller carriages; and intermediate between these latter are gusset brackets, uniting the whole into one stiff curb. In each lift vertical stays and internal guides descend 13 inches below the cups and the bottom curb; and the cup roller carriages on the inner and middle lifts are fixed against the extension of these. The side sheeting is of No. 10 B.W.G. thickness, with one row $\frac{1}{4}$ inch thick next the cups and dips.

The guide-framing consists of 28 standards and six tiers of girders. The standards are composed of a front and back limb of 16 in. by 6 in. steel joist; and these are united by double struts of 6 in. by 4 in. by $\frac{1}{2}$ in. T-bar at 5 ft. 6 in. centres apart, and by lattice bars $\frac{1}{2}$ inch thick on either side of the standard. Strong side plates $\frac{3}{4}$ inch thick, flanged out at the bottom, secure the two limbs of the standards to a sole-plate. The foundation-bolts pass through these; there being six bolts $2\frac{1}{2}$ inches diameter to each standard. The standards are 6 feet deep at the bottom, tapering to 2 feet at the top; and they are 149 ft. $10\frac{1}{2}$ in. high over all.

At the junction of the girders, wing plates $\frac{3}{4}$ inch thick are secured to the back and front of the standards by $\frac{7}{8}$-inch rivet passing through cast steel packing-blocks placed between the flanges of the joists. The top row of girders is of the box-shaped lattice type, 3 ft. 6 in. deep and 2 feet wide. The four angles of the box are 6 in. by 4 in. by $\frac{1}{2}$ in.; the side lattice bars being flat bars 3 in. by $\frac{1}{2}$ in., and the top and bottom bars of 3 in. by 2 in. by $\frac{5}{16}$ in. steel angle. The 6 in. by 4 in. angles are riveted to the wing-plates on the standards.

The intermediate girders are disposed horizontally. They are of the full width of the standards, and are made of two 12 in. by $3\frac{1}{4}$ in. channels, and double lattice bars of angle steel varying from 4 in. by $2\frac{1}{2}$ in. in the widest girders, to 3 in. by 2 in. in the narrowest, all $\frac{5}{16}$ inch thick. These girders are riveted to the wing-plates on the standards, and also bolted to the struts by means of top and bottom junction-plates. The guide-framing is braced by diagonal ties of flat bars, varying in length from 9 in. by $\frac{3}{4}$ in. at the bottom to 4 in. by $\frac{1}{2}$ in. at the top. The guide-carriages are provided with both radial and tangential rollers; the latter being fixed on pins bolted down to wing-plates carried by strong angles secured to the cheeks of the carriages as well as to the cups and top curb of the holder.

Livesey manholes are provided over the inlet and outlet pipes, which are 42 inches in diameter.

The holder has been constructed from the designs of Mr. G. Ernest Stevenson, M.Inst.C.E., the Consulting Gas Engineer to the Manchester Corporation; the Contractors being Messrs. Ashmore, Benson, Pease, and Co., Limited, who have carried out the work in their usual capable manner.

TEXAS GAS AND ELECTRIC LIGHTING ASSOCIATION.

Annual Meeting at San Antonio.

The Third Annual Meeting of this Association was held on the 19th, 20th, and 21st ult.—Mr. T. D. Miller, of Dallas, the President, in the chair.

The President delivered a brief Inaugural Address, giving his impressions of the New York Gas Exposition held in January last. Gas-stoves, incandescent burners, &c., were well represented; acetylene was noticeable for its absence; and sufficient prominence was not given, in his opinion, to the bye-products of gas manufacture. He passed on to consider the practical possibilities of acetylene; the conclusion arrived at being that, while it might have a field as a lighting agent, it would not come into general use, or compete with ordinary illuminating gas.

Mr. J. C. Lord, of Fort Worth (Texas), read a paper on "A Means of Largely Increasing the Summer Output of Gas." He was placed at some disadvantage by the number of communications dealing with his subject that had been read before other Associations since he undertook to prepare a paper, and which had to some extent forestalled the remarks he had prepared. Early in 1894, he commenced with a house-to-house canvass, offering a special rate of 7s. 3d. per 1000 cubic feet for fuel gas—the regular price being 8s. 4d. This secured him a sale of 160 stoves, and a fuel consumption of over 5,000,000 cubic feet before the end of the year, and encouraged him to reduce the special rate to 6s. 3d. per 1000 cubic feet. In 1895, 49 more stoves were put out; and the fuel consumption for the twelve months was 5,316,000 cubic feet. The price, notwithstanding the reduction, was an objection, and also the cost of service-pipes; so in April, 1896, the rate was reduced to 5s. 7d. per 1000 cubic feet, and the stove was fixed free if the consumer purchased it. Payment was by instalment; and he allowed 30 days' trial, after which the stove could be returned if unsatisfactory. This led to a sale of 218 stoves—only two being returned—and his fuel consumption for 1896 was nearly 8,000,000 cubic feet.

Discussion being invited, Mr. Holmes said the increased consumption was very gratifying; but he questioned whether it was not too dearly bought. He had been laying services at cost, and was considering the advisability of providing them free. Mr. Judge supported the policy named in the paper, as it was evident that the net profits were actually increased by means of business that could not be obtained in any other way. Mr. Cox said that the Galveston Gas Company had followed a similar policy, and with very satisfactory results.

Mr. Lord, in replying, said he sent out 17-candle straight coal gas. As the average consumption per stove was nearly 2000 cubic feet a month, it was evident they were in constant use. He made no charge for the meter, and rendered no minimum bills; and the concessions offered were the only means of securing additional business. He took some trouble to instruct people in the economical use of stoves; and if he did not do so, he would have many returned as too extravagant. It had been said that it was not fair to charge the lighting business with all the establishment expenses; but he might say that he had an electric light department furnishing incandescent lights at 2s. 1d. per month and arc lights at £1 0s. 10d., and had lost money by it.

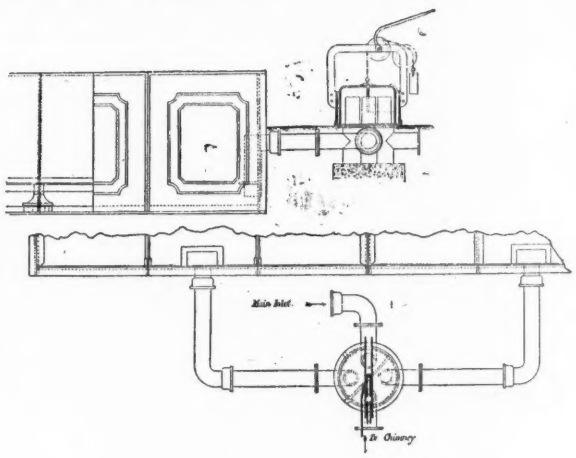
Mr. H. L. Monroe, of Dallas, read a paper on "Incandescent Lamp Efficiency: Its Importance to Central Stations," in which he stated that no error was so firmly rooted, so wide spread, or so productive of bad results as the idea that the life of a lamp was its most desirable feature. Usually the first cost and durability were the only points considered; leaving out the important question of efficiency.

A paper on "Little Things" was read by Mr. W. E. Holmes, of Austin, who dwelt on the importance of attention to details that were sometimes passed over as of no consequence. The question "Will it pay?" should not be guessed out, but carefully calculated in all cases. He instanced proper combustion in furnaces, the designing of plant for the production of electricity, of pressure-testing throughout the gas-works, of keeping an accurate record of gas made and electricity generated, regular systematic inspections, checking weights of materials received and used, adjusting the quality of the material to the work to be done, and keeping air from leaking into furnaces, as little matters that might be overlooked, but yet had a great deal to do with dividend-earning capacity, and therefore with the value of the undertaking. But it was not possible to deal properly with them in the absence of a thorough knowledge of the fundamenal principles underlying the construction and operation of each and every part of the plant. Having that, if each furnace, setting, boiler, dynamo, &c., was studied—not in a far-off abstract way, but closely and thoroughly till one was familiar with the little peculiarities, capabilities, and limitations of each, and how to get the best results under varying practical conditions—it would be possible to save money in many ways that need not be more particularly specified.

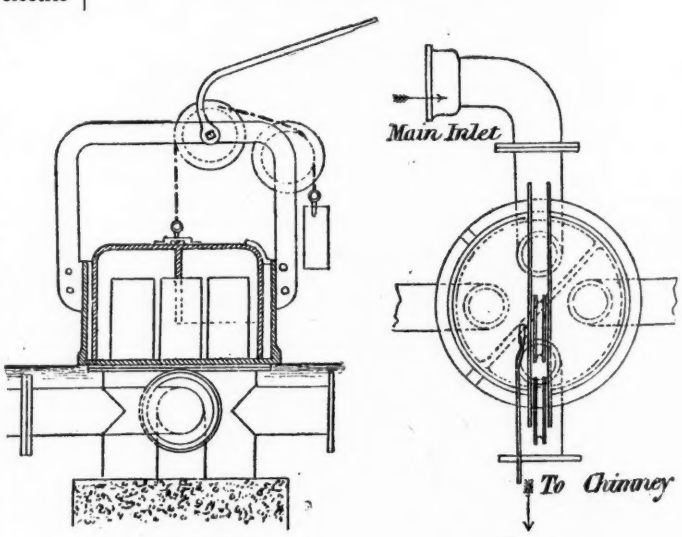
(To be continued.)

THE NEW CHANGE-VALVE FOR THE SULPHATE PLANT AT THE RICHMOND GAS-WORKS.

As mentioned in our notice last week of the recently-issued report of the Chief Inspector under the Alkali, &c., Works Regulation Acts (Mr. R. Forbes Carpenter), a new form of change-valve has been introduced in connection with the sulphate plant at the Richmond Gas-Works, by the Manager, Mr. Thomas May, jun., in co-operation with Messrs. C. and W. Walker. It is shown in the accompanying illustrations, which have been prepared from the report. The improvements embodied in the valve are that it is easy to lift and turn when change is required, and that at no time is the foul-gas main unsealed. Consequently, no escape of sulphuretted hydrogen can take place during change—a point to which special attention is rightly given by the most careful manufacturers. In last year's report, the Chief Inspector directed attention to a form of valve which has been in use for many years at sulphate works. But it has been pointed out to him that this type of valve has the disadvantage of unsealing the foul main, so that the workman is exposed to a certain amount of risk, which is not the case with the ordinary screw-down valve. By the modification now introduced, it is believed that this objection has been removed.



General Arrangement of Plant.

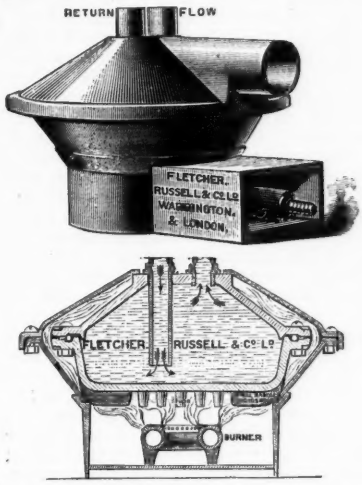


Elevation. Plan.

Hydraulic Valve for Working Purifiers to Sulphate of Ammonia Plant.

SUPPLEMENTARY GAS HEATER FOR DOMESTIC WATER SUPPLIES.

One serious drawback to the exclusive use of gas heaters, cookers, and ranges during the summer months is that the domestic hot-water supply, which is obtained through the ordinary boiler in the kitchen coal-range, is necessarily shut off. This is obviously a very great inconvenience. With a view of supplying a supplementary means of heating the domestic water supply, whether for sculleries, lavatories, or bath-rooms, making it altogether independent of the ordinary coal-range, Messrs. Fletcher, Russell, and Co. have adapted their greenhouse boilers, so as to be attachable to the circulating system connected with the hot-water cisterns; and where these boilers have been so far applied, they have, we believe, proved most efficient in maintaining the hot-water service. The accompanying illustrations—one showing the boiler in elevation, and the other in section—will make clear the construction of the arrangement.



These boilers, as will be seen, have a large and efficient heating surface in the simplest form; and they are readily accessible for cleaning. When required for indoor use, they are supplied without the outer casing; and if fixed in places free from draught, the duty will be found the same as when the casing is employed. In this case, however, the boiler will require suspending by the pipes, as it cannot be carried by the burner. Another advantage of the boilers is that they occupy very little space, the three sizes in which they are made ranging from 12 inches in height in each case to 13 and 19 inches diameter over all. They can be readily attached to ordinary circulating pipes; and when once set going, they need no attention. A cylinder of ordinary size can be filled with hot water in the course of three or four hours.

THE CONFERENCE OF THE INSTITUTION OF CIVIL ENGINEERS.

To complete our report of the portion of the proceedings at the recent conference of the Institution of Civil Engineers in which readers of the "JOURNAL" are interested, we now publish the two remaining papers on water supply questions; and, in the case of the first, a summary of the discussion is added.

Dr. EDWARD FRANKLAND contributed the following paper on

THE BACTERIOLOGY OF WATER.

The filtration of water, after being considered by some engineers as at least an unnecessary doctoring, has of late years assumed great importance in the economy of water supply, chiefly on account of its wonderful and unexpected power of arresting zymotic organisms, and also of preventing the action of soft waters upon lead. It is exclusively to its microbe-arresting power, however, that the author wishes on the present occasion to offer a few remarks.

While there is no water in Nature either chemically pure or free from suspended matter, neither is there any available for the wants of man, biologically pure. It is true that, on rare occasions, samples have been drawn from beneath filter-beds, or from deep wells, absolutely free from microbes and their germs, yet it is practically impossible to convey such water to the consumer in this sterile condition. During its passage through the mains, it becomes again inhabited by crowds of living organisms. The bacterioscopic examination of water used for dietetic purposes has of late years, however, deservedly assumed great importance in hygiene—chiefly because it has demonstrated that the domestic use of water which has been neither naturally nor artificially filtered is attended with great risk to life, if the water has been exposed to excremental pollution; whereas water, even much contaminated with pathogenic microbes, may be drunk with safety if previously submitted to efficient sand filtration. It has also supplied a test for the efficiency of filtration which is far more delicate than that contemplated by the Act of 1852—viz., freedom from opalescence or visible particles in suspension; for this parliamentary test may acquit a water which contains many thousands of microbes in a thimbleful. It is necessary at the outset, however, to protest against a view which has obtained considerable currency—viz., that the presence of microbes, in considerable numbers, in drinking water, shows the water to be unwholesome, or at least suspicious. In the absence of pathogenic organisms, there is no reason to suppose that even large numbers of the non-pathogenic are in the least harmful. During the prevalence of epidemic disease, however, it is of the utmost importance to secure efficient bacterial filtration.

Where is the bacterioscopic test to be applied? Some bacteriologists have applied it to water which, subsequent to filtration, has passed through several miles of distributing-main; but the rapid multiplication of microbes, especially in a comparatively sterile medium, renders such a method quite untrustworthy; and, in fact, the author has proved that, in the transit of water from Hampton to London, the bacteria increase more than tenfold. It is therefore evident that, as a test for efficient filtration, at all events, it must be applied immediately after filtration. A standard of efficiency is desirable; and 100 microbes per cubic centimetre is not unduly severe, although it is occasionally infringed, especially when the temperature of the water approaches the freezing-point.

The chief topics to which the author would like this discussion directed are: (1) Effect of floods on river microbes; (2) Effect of storage on the microbial contents of water; (3) Influence of initial bacterial impurity upon quality of filter-effluent; (4) Influence of fineness and thickness of sand; (5) Influence of rate of filtration; (6) Effect of scraping filters. Several of these topics have been carefully studied in Germany, and especially in America by the Massachusetts State Board of Health. The author's own experience has been gained chiefly from the bacteriological examination of the Rivers Thames and Lea, and of the filtered supplies of the seven Metropolitan Water Companies drawing from these rivers; these examinations having now been carried on systematically for five years.

(1) The author has found that the number of microbes per cubic centimetre in the raw river water is practically governed by the volume of flowing water—in other words, by the rainfall. The following table illustrates this for the year 1896; but the tables for the four preceding years are equally convincing.

TABLE I.—*Comparison of Number of Microbes with Volume of Thames at Teddington Weir.*

Date.	Flow of River in Gallons Daily.	No. of Microbes per Cubic Centimetre.
Jan. 10	1,152,500,000	11,560
Feb. 10	948,400,000	26,800
March 10.	1,672,600,000	18,000
April 18	741,900,000	7,520
May 12	374,600,000	2,060
June 10	421,000,000	6,760
July 2.	261,800,000	2,220
Aug. 24	216,400,000	1,740
Sept. 9	430,800,000	4,300
Oct. 8.	2,624,500,000	39,760
Nov. 4	929,700,000	8,560
Dec. 8.	3,839,900,000	160,000

(2) The effect of storage in reducing the number of microbes in river water is extraordinarily great. Thus, while the number of microbes in 1 cubic centimetre of Thames water at Hampton, during five years, averaged 19,258, it was only 1649 after storage for about thirteen days; and while the Lea at the East London Company's intake averaged 20,376 per cubic centimetre during these years, this number was reduced to 4304 by storage for about fourteen days. It can scarcely be doubted, therefore, that a couple of month's storage would reduce the bacterial impurity of even the worst water of the Thames and Lea to a very moderate amount. The same thing may be observed in natural lakes. Thus the mountain streams entering Bala Lake swarm with bacteria, while the lake itself, near the foot, contains only 116 per cubic centimetre; and the River Niagara rushes into Lake Ontario teeming with microbes, which rapidly disappear in the lake. These are the facts; the cause may give rise to controversy. Mr. Sorby tells me that storage has the opposite effect on *infusorial animalculæ;* and I would suggest that these prey upon the bacteria in the reservoirs, and probably also determine their destruction upon filter-beds.

(3) As to the influence of the initial bacterial condition of water upon the effluent from sand filters, Dr. Koch has asserted that the bacterial quality of the effluent has no connection with the density of microbe population before filtration—that water containing 50,000 microbes per cubic centimetre will yield as good an effluent as one containing only 500. The author cannot say that this agrees altogether with his experience, as will be seen from an inspection of Table II. (next page).

(4) As regards the influence of the size of sand grains upon the bacterial quality of the effluent, my observations agree with those made by the Massachusetts State Board of Health. They prove that fineness of sand and effective bacterial efficiency

march *pari passu*. Thus, as is seen from Table III., the West Middlesex Company, by the use of finer sand, are able, with much less storage, to attain a higher degree of bacterial efficiency than the Chelsea Company.

TABLE II.—*Reduction of Micro-Organisms by Actual Filtration.*

Month.	Chelsea Company.			West Middlesex Company.		
	Organisms per Cub. Cm.		Per Cent. Organisms left in.	Organisms per Cub. Cm.		Per Cent. Organisms left in.
	Before Filtration.	After Filtration.		Before Filtration.	After Filtration.	
Jan. . .	1,360	20	1·5	3,460	44	1·3
Feb. . .	460	44	9·6	1,820	16	0·9
March . .	240	28	11·7	2,340	24	1·0
April . .	Lost	4	..	720	20	2·8
May . .	140	24	17·1	280	4	1·4
June . .	..	..	..	..	..	..
July . .	420	20	0·6	680	8	1·2
Aug. . .	200	18	4·8	300	6	2·0
Sept. . .	140	2	1·4	120	14	11·7
Oct. . .	340	8	2·4	740	30	4·1
Nov. . .	280	12	4·3	5,520	25	0·4
Dec. . .	854	55	6·4	26,760	120	0·4
Mean .	..	..	6·4	..	..	2·5

TABLE III.—*Degree of Fineness of Sand.*

Company.	Thickness of Sand.	Percentage of Sand of less than 4 Millimetres.	Percentage of Organisms Left in.
Thames.	Feet.		
Chelsea	4·0	26·10	6·0
West Middlesex.	2·75	78·19	2·5
Grand Junction	2·25	28·70	8·9
Lea.			
New River	1·8	60·26	2·2
East London.	2·0	33·12	3·1

This table also shows that thickness of sand has much less influence than might be expected—a conclusion which is confirmed at Massachusetts, where it has been found that the depth of sand between 1 foot and 5 feet exercises no practical effect on bacterial purity when a proper rate of filtration is maintained.

(5) The effect of the rate of filtration upon the bacterial purity of the effluent cannot be usefully studied in this country, because the rates at which filters are operated here vary between too narrow limits. For instance, the rates employed by the Engineers of the London Water Companies vary only between 1,359,000 and 1,986,000 gallons per acre per 24 hours. But numerous experiments lead the Massachusetts State Board of Health to the conclusion that, other things equal, a rate of filtration varying between 500,000 and 3,000,000 gallons per acre per 24 hours exercises practically no effect whatever on the bacterial purity of the filtered water, for at all rates between these limits the Massachusetts filters removed 99·9 per cent. of the microbes present in the raw river water.

(6) Great attention has been paid to the effect of scraping filters at the Massachusetts station, with the result that, after this operation, there was often an increase in the number of bacteria in the filtered water; and it was noted that the increase was greater in shallow than in deep filters, with high than with low rates of filtration, and with coarser than with finer descriptions of sand.

Discussion.

Mr. W. H. Y. WEBBER (London) said he should like to ask Dr. Frankland a question bearing on the subject of the paper, which he did not think he had ever seen properly explained. It was with regard to the comparative keeping qualities of water that had once been highly polluted, and then had cleaned itself naturally, as compared with water that had not been subjected to such previous pollution. He remembered as a boy in the port of Exeter that the men on the coasting-vessels used always to fill their scuttle-butts by dipping from over the side; and the town sewers were not far off the place where they replenished them. The old skippers used to say they did the same thing in the Pool of London. They kept this water (which was for drinking purposes) through all their voyages, which sometimes extended a considerable time, and in hot weather. In a few days after the water was put in the scuttle-butts, it stank abominably; but in a few more days it was clear and limpid, with only a little black deposit on the bottom of the butt. The men objected to the pure supply from the town mains, because, they said, if they kept it similarly exposed, it went bad, and did not purify itself.

Mr. GEORGE HODSON, referring to the enormous increase in bacteria in times of flood, said they all knew that bacteria existed in the soil in millions; and during periods of heavy rains, countless numbers of these must be carried away by every rill into ditches, and from these into the streams and rivers. He had often thought that the reduction in the number of microbes by the storage of water was in great measure due to the fact that the majority of them were not water bacteria; and, being unfit to live in water, they simply died off. He thought if the bacteriological examination of water was to have any useful effect, a certain standard ought to be adopted by all experimenters. For instance, the sample of water should be taken immediately after filtration; and a time should be fixed for cultivation. The rate of filtration was a most important factor in the question of getting rid of microbes; it should be at a slow rate, and through fine sand. What they now required to find out was how long the microbes required to perform their work properly in the interstices of the sand filter. In sewage filtration, gas-works coke, broken down to about the size of peas, seemed to him so far to be one of the best materials they could use.

Mr. G. F. DEACON, referring to Dr. Frankland's statement that he had observed a tenfold increase of bacteria in the transit of water through a main running from a filter-bed, said he should like to ask whether any part of the main was otherwise than under water pressure for a considerable time previous to the observations. If any of the branches from the main were subjected to intermittent service, the cause of the increase was at once apparent. Alluding to the results obtained by Dr. Frankland in the examination of raw river water, he remarked that undoubtedly an increase of microbes followed from the increased scour of the river. But there came a time in the flow of the Thames and of most other rivers—in the height and velocity of stream—at which the scour was not increased per unit of volume as it was before; and what he found was that, when the River Thames was flowing at more than 2200 million gallons a day at Teddington, if they limited their considerations to the quantities of water above 2200 millions and to immediately below that quantity, they would find that practically there was no difference in the number of microbes per unit of volume. Why he used this figure was because 2200 million gallons was the figure at which it was proposed to cease to adopt a particular remedial work proposed by an Act of Parliament some time ago. With all Dr. Frankland said as to filtration, he agreed. The depth of sand had exceedingly little effect, except immediately after the filter had been cleansed. But after a day or so, there was practically no difference between 6 inches or 2 to 3 inches, because the whole of the work was done at, or very near to, the surface. The size of the grains, providing there were no extremely fine ones to absolutely obstruct the flow of water, was also important—the smaller, the better.

Mr. G. HILL said that some fifty years ago Mr. Bateman, who was then the Engineer for the Manchester Corporation Water-Works, saw very early the necessity, if it were possible, to keep the good water separate from the turbid. On the old system at Manchester, where they had large compensation to pay to the river, they diverted the turbid and flood waters to those reservoirs which were for compensation purposes, and retained all the good water in the larger reservoirs. They had some eleven or twelve reservoirs; and the water was decanted from reservoir to reservoir, and was finally passed through settling-pools before it came down to the service reservoir. He did not mean to say filtration would not improve the water; but Mr. Bateman's system had been very effective. Dr. Frankland said distinctly that the effect of storage in reducing the number of microbes in river water was extraordinarily great; so that the system of having a series of reservoirs for storage must materially improve the water. Regarding the use of filters, it was very desirable, after a filter had been cleansed, that it should not be put to work at once. If water was allowed to remain in it a day or two, a sort of scum would accumulate on the surface of the sand, which would arrest many of the microbes. He also urged the advisability of having a large amount of storage, so as to avoid taking water from a river when in flood.

Mr. WALTER HUNTER said the Grand Junction Company (with whom he was connected) had a small amount of storage; and it was partly for this reason, and to improve the supply and enable them to take more water from the Thames, that they, in conjunction with the New River and West Middlesex Companies, had gone into the Staines reservoir scheme. When they had carried it out, they would be in a different position in regard to storage for settling purposes than they had ever been in before. The Grand Junction Company had some trouble last year, particularly during the floods, with regard to their water; but they were enabled, by the system of double filtration which was introduced by the late Mr. Alexander Fraser, to overcome the difficulties in regard to the microbes. He was glad to see Dr. Frankland stated that the presence of microbes in drinking water in considerable numbers did not show the water to be unwholesome. While all these matters were most interesting, and gave them a standard up to which they might endeavour to rise, yet the death statistics were a most eloquent testimony to the admirable way in which London was supplied with water. His Company were now spending £100,000 in improving their storage and filtration; and he thought this fact alone showed that the London Water Companies were earnest and desirous of doing their duty by the public, because this expenditure was clearly unprofitable, and would not add sixpence to their revenue.

Mr. WALTER HODSON urged that in bacterial investigations a general standard should be adopted; so that the results might be compared.

Dr. S. RIDEAL thought they ought to have a better standard

than the arbitrary limit of 100 microbes per cubic centimetre, not only for the reason that it was difficult to define when a sample should be taken, but because the 100 organisms did not mean anything from a hygienic point of view. What they should really aim at was to determine the number of pathogenic organisms; and the ideal limit should be that no pathogenic organisms should be supplied to the water consumers. There should be no pathogenic organisms which could grow at blood temperature; and then they would know there were no organisms present which would have a chance of living in a consumer. The table giving a comparison of the number of microbes with the volume of water at Teddington Weir seemed to show there was a great connection between the volume and the number of organisms. But one must not forget that sunlight and temperature had an important effect on the organisms; and it would have been interesting if Dr. Frankland had given them the sunlight and temperature against the different samples examined. When dealing with a large volume of flow, it was possible that, if a sample of only 1 or 2 cubic centimetres was taken, there might be quite an army of bacteria in that particular sample; and this would vitiate the results. Unless a great number of experiments were made on a particular day, they could not regard the results as reliable.

Mr. W. WHITTAKER, speaking of sand filtration, suggested that the character of the sand should be examined microscopically, just as much as the character of the water. Geologists had got to know that sands differed very materially in their structure. The grains of some sands were very round; while those of other sands were angular. It would be interesting to know whether this had any effect in connection with this particular subject. It was quite conceivable that a sand of an angular grain would have a greater effect than sand of a more rounded form.

Mr. D. BALFOUR (Newcastle-on-Tyne) mentioned an instance where two springs in Northumberland, which were intended for water supply, were subjected to bacteriological examination, with the result that one gave 94 bacteria per cubic centimetre, and the other only 14. Samples of the water were then submitted to chemical examination; and this fully corroborated the bacterioscopic test.

Dr. FRANKLAND, in his reply, said he had no doubt the scour of the river had a great deal to do with the number of microbes found per cubic centimetre; and his table showed there were variations from the rule he had laid down, where samples had been taken after there had been a great scour for some time. With regard to the standard of 100 microbes, that ought only to be applied to water immediately after filtration. Regarding Mr. Deacon's question as to whether the main in which he found the bacteria had increased tenfold was intermittently charged, he believed the samples were taken from stand-pipes on live mains. [Mr. HUNTER: Those mains are constantly charged.] His own idea about the multiplication of these microbes was this: The culverts connected with the filters were lined as it were with a stratum of microbes, which clung to the surface; and it seemed probable that bacterial epidemics might be caused by a sort of migration of the microbes at particular seasons, when they had arrived at such a thickness that they could not find sufficient subsistence there. Then there would be a considerable increase in the number of microbes at the other end of the main. With regard to Mr. Webber's question, he could quite imagine that the clarification and purification of water which had been highly polluted—for instance, from the lower reaches of the Thames, where the water used to be taken for shipping—would be caused by the large number of microbes absorbing all the nutritive matter in the water which was essential to their life. They then died and fell to the bottom; leaving the water in a condition less likely to be affected than much purer water. It was found that the purer and freer from microbes a sample of water was, the more rapidly did the microbes increase. For instance, in a sample of deep-well water which was practically free from microbes when taken, the number increased very rapidly in comparison with the increase in water from the River Thames or Lea.

Mr. W. Fox contributed the following notes on the

RELATION BETWEEN RAINFALL, FLOW OFF THE GROUND, SIZE, AND ACTUAL YIELD OF RESERVOIRS.

In deciding the size of storage reservoirs, unless they are calculated to store the rain falling in wet years to equalize the flow with dry years, the usual practice of taking as a basis the rainfall from January to January in each year is open to doubt. More accurate results would be obtained by commencing the yearly record from the same time that the drought ceases, and the reservoir is most likely to be emptied, and when the yield of the gathering-ground is at its lowest (say, from Oct. 1 instead of from Jan. 1); for it is obvious that rain falling in October, November, and December of any particular year can have no beneficial effect in supplying the reservoir in the previous months of that year. This suggestion does not, however, affect the result to the same extent when the calculation is made on an average of two or three dry years.

The deduction to be made from the rainfall to provide for evaporation and absorption in the hilly districts of this country on which storage reservoirs are usually constructed, is from 12 to 14 inches. During the drought of 1893, the author had an opportunity of taking some observations on this point, which led him to the conclusion that from a gathering-ground of 470 acres of moorland pasturage, undrained and without any peat deposits, ranging from 850 to about 1200 feet in altitude, the loss by evaporation and absorption from March 10 to Sept. 28 was 13 out of the 16 inches that fell. During the winter months, the loss from evaporation and absorption is very little.

The area of gathering-ground and available minimum rainfall for one year give the daily average yield of the district throughout the year; and the storage required to utilize the whole of this is then dependent upon the period during which the flow from the district is less than the calculated daily average yield after deducting from the calculated daily average yield the calculated average flow from the stream during the same period. This is working upon the minimum rainfall for one year only; but if the yield of the district is calculated upon an average of three consecutive dry years, it is obvious that it will be larger, and the storage capacity must also be larger. To calculate it on the average rainfall of the three dry years will lead to the provision of inadequate storage should the first or second of the three dry years exceed the average, as water will run to waste during the first winter, and there will be a deficiency from that required to fill the reservoir during the succeeding winters; and therefore the storage necessary to utilize all the available rainfall calculated on an average of three dry years must be based upon the rainfall of the wettest of those years, although the total yield of the district is only measured by the average, or otherwise a deduction must be made from the average rainfall to allow for uncollectable floods.

Much has been said on the question of the relation between mean and annual rainfall. In a very exhaustive paper presented to the Institution by Mr. A. R. Binnie in 1892, he suggested that the average of three dry years amounted to 78 per cent. of the mean rainfall; and this was practically agreed to by Professor Symons and others. But the ratio of the wettest to the driest of three dry years appears never to have been considered. In the above-mentioned paper, the driest year is considered to be 66 per cent. of the mean; the two driest, 73 per cent.; and the three driest, 78 per cent. Although no exhaustive examination has been made of rainfall returns with a view to ascertaining any like relation between the fall of the three driest years compared with each other, or with the mean rainfall, it is probable that the reservoir capacity to utilize 78 per cent. of the mean will have to be calculated on a mean rainfall, or very nearly so. It seldom happens, however, in upland districts in this country that the configuration of the ground permits of sufficient storage being obtained, except at very great cost. An area of 4000 acres with an average rainfall of 55 inches being taken as an example, 78 per cent. of this gives 42·9 inches as the average of three dry years; and deducting 14 inches leaves 28·9 inches (say, 29 inches) as the available rainfall over an average of three dry years. But to obtain this, storage must be provided for 55 inches, *minus* 14 inches, or 41 inches, after allowing for the average yield of the stream during an extreme drought of not less than 150 days—

	Cubic Feet per Day.	Cubic Feet.
41 inches per annum on 4000 acres . .	1,631,000	
1,631,000 cubic feet × 150 days		244,650,000
Less yield of stream, say, ½ cubic foot per second per 1000 acres = 2 cubic feet for 150 days . .		25,920,000
Storage required . . . . . or about 54,000 cubic feet per acre.		218,730,000

The actual yield of such a district calculated on 78 per cent. of the average rainfall would be 29 inches per annum on 4000 acres = 1,153,000 cubic feet per day. The result is that, with the above-mentioned rainfall, storage will be required of about 54,000 cubic feet per acre; and if this is not obtainable, the daily yield of the district must be measured by such storage as can be obtained, divided by the length of the drought, to which is added the average yield of the stream during the period of drought.

In referring to the duration of a drought for water-works purposes, a period is not suggested during which absolutely no rain falls, but one during which no rain falls which has the effect of increasing the springs, or of more than very temporarily increasing the flow off the surface. A thunderstorm yielding even as much as an inch of rain falling in July or August, when the ground is parched, and vegetation is in a state to absorb much water, will have little or no effect measured as water stored.

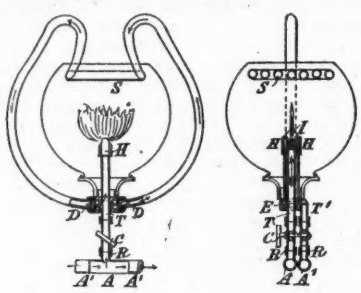
From the water stored, a deduction must always be made for evaporation from the surface, and absorption. Sir Guildford Molesworth in his valuable pocket-book places this loss in India at 6·15 feet per annum for evaporation, and 3·62 feet for absorption; making, say, 10 feet per annum. Professor Symons in "British Rainfall" for 1895 gives the evaporation from a tank at 14·66 inches, the average of eleven years' observations by himself at Camden Square; and 20·46 inches, the average of four years' observations taken by Mr. William Matthews, at the Southampton Water-Works. The loss from both causes may therefore be taken in this country at something like 3 feet. This takes place mostly in the summer, and will go on as the reservoir is being drawn down; and if drawn down regularly, it forms a definite proportion of the whole depth and capacity of the reservoir. Thus, if the reservoir is 50 feet deep, three-fiftieths of the total capacity, and if 100 feet deep, three-hundredths of the total capacity, will be lost.

REGISTER OF PATENTS.

Facilitating the Combustion of Acetylene Gas.—Coppeaux, C., of Brussels. No. 9630; May 6, 1896.

This invention relates to a method for effecting the "complete combustion of acetylene, which consists essentially in feeding an acetylene flame with a forced current of hot or cold air, independently of the surrounding air, so as to supply the flame during combustion with the exact quantity of air, and consequently of oxygen, that is necessary for effecting combustion under the conditions most favourable to illumination."

The method consists in using an acetylene conduit supplying the gas from any suitable generator, and a conduit into which the air is forced, through a pressure-regulator, by mechanical means—such as a fan or blower—and by employing in the burner two or more conduits for supplying air and gas, arranged in such a manner that the acetylene flame shall be in some way licked by one or more layers of compressed air. Conduits for supplying air and gas in this way may be variously arranged. In one type of burner, there are three converging conduits; one situated between the two others—the middle one used for gas, and the outer ones for air, or *vice versâ*. In a second type of burner, there are two converging conduits—one for gas, and the other for air. Another having two conduits has them oppositely directed, so that the jets of gas and air issuing impinge directly against each other. In another type, a central conduit is surrounded by a converging conduit of annular cross section—the former used for air, and the latter for gas, or *vice versâ*. Another type has three parallel conduits; one between the other two—the inner one for gas, and the other for air, or *vice versâ*. Still another type of burner has two bifurcated conduits arranged in line with each other, and oppositely directed; the arrangement being such that the jets of air and gas impinge obliquely against each other.



A practical example is shown of a burner of the kind described, in which the air which feeds and causes the formation of the flame is first heated by the flame of the gas itself. Upon the two pipes A and A^1 of a double air and gas conduit, is fixed a double union R, which carries the burner. The latter is constituted by two main conduits T T^1, provided with a double cock C. The conduit T serves to supply acetylene, and, rising directly above the cock, extends upwards till it forms a small aperture for the escape of the gas. The second conduit T^1 serves to supply the burner with air delivered under pressure into the conduit A^1. This conduit rises a little above the cock, and communicates with a passage D bent in such a manner as to pass overhead, at some distance from the outlet aperture of the acetylene conduit T, where it forms a serpentine coil S. The part where the conduit D finally terminates is provided internally with an annular conduit E, to which are connected two small conduits parallel to the conduit T, and terminated by nozzles H, each furnished with an opening directed obliquely in such a manner that the axes of the openings intersect at a certain distance above the opening of the pipe T and in the axis of this pipe.

When the cock C is opened, the gas under pressure escapes directly through the opening of the pipe T, at the outer extremity of which it can be ignited. The air under pressure passes from the conduit A^1 into the conduit D, circulates in the serpentine S, and escapes through the orifice of the nozzles H. The two jets of air under pressure encounter each other at a point I on the jet of gas; thus bringing about simultaneously the expansion of the jet of gas, which assumes the form of a batswing-burner for ordinary gas. At the end of a few seconds after ignition, the coil S placed above this flame is heated, and from this time the flame is fed with hot air.

To obviate the need for using mechanical power to produce the compressed air-jet required to feed the acetylene flame, the patentee proposes to employ an arrangement in which the air-pressure is produced by the acetylene itself, the pressure of which is arranged to operate an air-compressing device. To effect this, two acetylene generators, containing carbide of calcium, receive water from a higher reservoir through a suitable pipe. The gas generated and given off by the generator in action, passes by a pipe into an expansion cylinder provided with a piston, which operates, by means of suitable levers, an air-compressor in communication with an air-bell, provided with a pipe through which the air passes to the burners. The expansion cylinder is in communication with a gas-holder, provided with a pipe through which the gas can pass to the burners. In proportion as the gas is generated in one of the generators—and as, consequently, its pressure increases—the piston in the expansion cylinder (upon which there is the counterpressure of the gas expanded under the normal pressure) rises, and operates the air-compressor, which delivers into the air-bell. On the other hand, the expanded gas passes to the gasholder.

Manufacture of Water Gas.—Goldschmid, J. E., of Frankfort-on-the-Main, and Dellwik, C., of Stockholm. No. 11,632; May 28, 1896.

The objects aimed at by the patentees are: Firstly, to ensure a uniform glowing of the column of coke in the generator throughout its whole height; and, secondly, to secure its complete utilization. The water gas is made as usual, by forcing steam through coke alternately from top and bottom—twice from the bottom, and once from the top after each blowing-up. The generator has valves, through which air is introduced under the grate, and also through tuyeres at different heights. The various outlet-pipes meet in a valve-casing, from which leads the main outlet-pipe. Steam admission-pipes are provided at top and bottom of the apparatus; and also an outlet for the combustion products formed during the blowing-up. Arrangements comprised in the invention serve for shutting off the gas outlet-pipes and air supply-pipes of the valve and tuyeres, in such a way that one valve cannot be closed or opened without bringing the other valve in a position corresponding to the altered position of the first valve.

Regulating Devices for Gas-Burners.—Teed, F. L., of Victoria Street, S.W., and Teed, H. W., of Camberwell Grove, S.E. No. 13,764; June 22, 1896.

In the regulation devices constructed according to this invention, a small continuous flow of gas is allowed to pass to each pilot burner while the main burner is alight and the supply to the pilot burner nominally cut off, by employing a valve intentionally made leaky, or by permitting a slight flow of gas thereto, so that loss of gas in the pilot-jet and passages by diffusion is compensated, and the pilot-jet will not fail to ignite upon the extinction of the main jet.

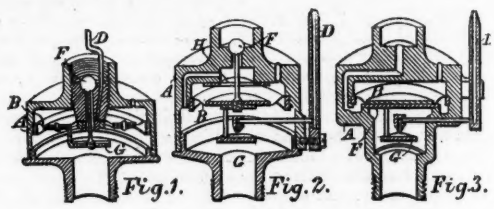


Fig. 1. *Fig. 2.* *Fig. 3.*

As shown in the engraving, fig. 1, a flexible diaphragm B is secured within the chamber A by rings, which engage respectively with the circumference of the diaphragm, and with the margin of it around a central opening therein. D is a pilot-burner, with a tubular connection from the space below the diaphragm to the pilot-pipe D; the lower end of the connection having its mouth extended downward, as shown. F is the main valve—a ball-valve in this instance—controlling the flow of gas into the exit-opening. The distance between the main valve and the main burner is reduced as much as possible, so as to render ignition of the main burner certain by reducing to a minimum the amount of air to be displaced from the space by the gas issuing just after the opening of the main valve. In this way, the gas very rapidly comes into contact with the pilot-flame, before the latter is extinguished. The main valve is connected to the diaphragm B by a rod. G is a pilot-valve controlling the passage of gas from the chamber A to the pilot-burner D; and by a rod the pilot-valve is connected to two annular washers, which grip between them the diaphragm B—being connected to each other by screws passed through the diaphragm.

There are slight differences in construction of certain of the details in fig. 2. For instance, the gas is led from below the diaphragm in the chamber A by passages to the main exit; one passage being formed in the wall of the chamber A. Also the rod of the valve is directly connected to washers in the centre of the diaphragm, and passes from the diaphragm to the valve through a central perforation in a disc H of oiled leather, retained in place by a ring secured by screws to the body A. The disc serves as a gas-tight packing for the valve-rod, upon which it exerts very little friction. The main and pilot valves F and G are both connected to the diaphragm B, and are so disposed that when one is closed the other is open, and *vice versâ*—the main valve being shut and the pilot-valve open, in the modifications illustrated.

A further modification is depicted in fig. 3, in which the valve F is of disc form, and is carried at the underside of the diaphragm B, so as to make joint with an annular seating formed in the interior of the chamber A as shown; the ball-valve F and its rod are not needed in this modification.

Artificially Imparting an Odour to Gas.—Strache, H., of Vienna. No. 14,941; July 6, 1896.

In order to impart a distinctive odour to (say) water gas containing large percentages of carbonic oxide, the patentee proposes to produce a substance embodying some particular "carbylamine." The amine to be employed—for example, methylamine, ethylamine, aniline, toluidine, &c.—is dissolved in alcohol, and then decomposed with an alkali (caustic potash or caustic soda), and chloroform added thereto. After the reaction thus produced is completed, the solution is absorbed by a porous material—such as animal charcoal, pumice, wood-shavings, wood-wool, sawdust, or the like—and the gas to be perfumed is led over the substance in suitable apparatus. The alkali can also be dissolved in alcohol, and the amine be added directly afterwards. Moreover, the alcohol can be recovered after the completion of the reaction, by distilling it off, if a carbylamine having a high boiling-point be used.

A practical method of preparing the odorizing material is the following: On the one hand, about 30 grammes of aniline are dissolved in 600 grammes of alcohol; and, on the other hand, 100 grammes of caustic soda are dissolved in 70 grammes of water. The two solutions are brought together, and 45 grammes of chloroform are cautiously added thereto with stirring—the mixture being frequently shaken during one day, and then allowed to settle. The solution of carbylamine so obtained can be used directly for odorizing gases.

By this process, a very dilute product is obtained, which only contains a little over 3 per cent. of carbylamine. If it is desired to obtain a concentrated product, which does not at the same time contain dissolved chloride of sodium, and therefore can be vaporized without leaving behind any residue, the following process is employed: Fine granular soda lime has the calculated quantity of aniline poured over it, and is heated to about 100° C.; and to the mixture the calculated amount of chloroform is added, drop by drop, with continual stirring. The reaction, which rapidly sets in, does not proceed too violently, if the chloroform be added cautiously, and in small quantities. The completion of the reaction can be determined from the appearance of the substance, in which the chloride of sodium and chloride of calcium produced form a coherent mass. After cooling, a part of the carbylamine can be separated from

the salt by decantation, and can be used directly for odorizing gas, whereby an effect can be obtained about thirty times more powerful than by the use of the diluted product. The part of the carbylamine clinging to the salt can be obtained by leaching with the smallest practicable quantity of alcohol, allowing to settle, and pouring off. It forms a less concentrated, but still a very strong, product (50 per cent. strength).

Burners for Incandescent Gas-Lamps.—Strache, H., of Vienna. No. 14,942; July 6, 1896.

The patentee points out that burners for incandescent gas-lamps have been constructed on the principle of supplying the air from beneath, while the apertures from which the gas issued were at some distance from the incandescent body. In the more recent methods of construction, greater value is attached to the smaller distance from the incandescent body of the opening from which the gas issues; and for attaining this object, for a given size of incandescent body, the diameter of the argand burner must be increased. In this way, however, the air supply between the opening from which the gas issues and the incandescent body is naturally reduced—finally equal to zero, if the outlet-openings lie against the incandescent body. Experiments have, however, shown that an air supply between the opening from which the gas issues and the incandescent body, substantially increases the illuminating power; the consumption of gas remaining the same. On this discovery is based the present invention of a burner, wherein the openings from which the gas issues can be placed as near as is desired to the incandescent body, without thereby interfering with the air supply to any single flame.

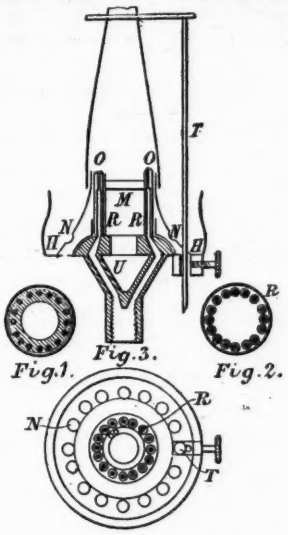


Fig. 1. Fig. 3. Fig. 2.

The burner consists of small tubes, arranged in a form corresponding to that of the incandescent body. They are so mounted that a perfect air supply reaches each flame on all sides, by being so arranged as to be isolated or detached from one another as much as possible, and yet secured on a common base. The advantage obtained by this arrangement over the ordinary argand burner can be seen from figs. 1 and 2. From fig. 1, it is apparent that, in the ordinary argand, the openings from which the gas issues lie closely to the incandescent body; and the air supply to the separate flames can only take place from the central opening of the argand, and from the exterior, through the meshes of the mantle fabric. Fig. 2 shows that in the Strache burner, on the contrary, each single flame is provided with air on all sides within the mantle.

One form of the burner is shown in fig. 3. U is the under part of the burner, which is made after the style of the ordinary argand. On this are mounted small tubes R, which form at the top the openings O, through which the gas issues. A ring M holds the tubes at the correct distance apart from each other and from the mantle. A tubular piece or shell H is rigidly connected to the gallery, to serve as a holder for the mantle, which is held by the support or carrier T. N are openings formed in the shell or casing, in order to supply air to the space outside the mantle.

Valve-Gear for Gas-Engines.—Wood, C., of Bridgwater Square, E.C. No. 28,892; Dec. 16, 1896.

This valve-gear for an "Otto" cycle gas-engine comprises a pinion on the crank-shaft operating a spur-wheel with twice the number of teeth, and carrying a crank-pin, operating a lever actuating the exhaust-valve. There is a link connecting the small crank-pin and the lever, and a cam upon the link actuating a second lever, which controls the gas and air inlet-valves.

Support for Incandescent Gas Mantles and Globes.—Wren, A., of Pollokshaws, Glasgow. No. 1186; Jan. 16, 1897.

The inventor claims the combination of an incandescent burner, a globe or support for the burner, a flexible connection between the burner and the gas supply-pipe, means for suspending the burner and its globe or support, and a spring device for suspending the burner and globe. With this arrangement, the burner is suspended by a spring at the top, and has an elastic connection at the bottom, so that it is said not to be subject to the same vibration as with present arrangements.

Acetylene Gas Furnace.—Sterza, A., of Mantova, Italy. No. 1549; Jan. 20, 1897.

This furnace for rendering acetylene gas suitable for heating purposes, is formed of two vases one inside the other, and between which the acetylene passes through several wire cloths and asbestos cloths before being burnt, after becoming thoroughly mixed with air.

Incandescent Gas-Lamp Burners.—Döhner, R., of Hamburg. No. 1863; Jan. 23, 1897.

This bunsen burner for incandescent gas-lights is characterized by a cup-shaped sleeve arranged underneath the burner-head, and acting as a circular protector for the lower part of the mantle, and by a ring cone (with holes) pushed over the lower conical and bored part of the burner tube, for the purpose of protecting the air-inlet to the burner.

Acetylene Gas Lamps and Generators.—Dennis, W. H., of Minneapolis, U.S.A. No. 2976; Feb. 4, 1897.

The object of this invention is to provide a small gas-generator particularly adapted to be embodied in the form of a table or wall-bracket lamp. The generator comprises an upright support or standard, with two tanks arranged thereon, connected by a duct or passage. One tank is a water container, and the other tank has a carbide shell or holder arranged in its lower end, and easily removable therefrom. The water is taken from the duct and sprayed or dropped into the shell or holder in the second tank, so as to generate gas from the material therein; the gas being preferably used in burners arranged on the upper end of the support.

Gas-Engines.—Dunsmore, M. C., of Stirling. No. 6035; March 8, 1897.

This invention in respect to gas-engines is designed to secure a motor stroke at every revolution of the crank, with a rapid motion of the piston at the point of greatest expansion. Also by arranging the ratios of the volume of the gases before and after expansion as about 1 to 1·7, a noiseless exhaust is effected, and the power usually thrown to exhaust is utilized. Further, the engine, after having been started once, is, by storing up a portion of the energy, made self-starting; and by utilization of the heat of the exhaust gases, the engine is rendered to some extent regenerative.

In carrying these improvements as applied to a gas-engine into practice, it is arranged that the gas and air are drawn by the instroke of the piston into an annular space formed in front of it, where it is compressed by the outstroke and forced within storage tubes or the like. Here the mixture is heated by the exhaust gases from the cylinder; and it passes thence as required to the cylinder to be exploded. Or it may be burnt as it enters at constant pressure—ignited by a flame kept burning within the cylinder, in which case the back end of the cylinder would not be water jacketed.

Illuminating Partly by Flame and Partly by Incandescence.—De Léry, J. B., of New York. No. 7920; March 27, 1897.

This invention has for its object "to utilize that portion of the heat from the gas-flame which is now wasted, to increase the illuminating power of the flame." The patentee proposes to combine ordinary gas lighting with gas lighting by incandescence, by locating a web or network

of incandescing material at such a point adjacent to the burner that the flame from the latter will impinge at its outer tip against the incandescent web or net. This arrangement, he says, permits of the diffusion of all the ligh trays from the flame itself, and creates additional light rays from the incandescing body. The preferred form in which the burner is made is shown in the accompanying illustration.

APPLICATIONS FOR LETTERS PATENT.

12,756.—Langfield, J., and Kenworthy, G. H., "Gas-stoves." May 24.
12,806.—Singer, P. E., "Rotary-piston gas and oil engines." May 24.
12,815.—Pfeil, C., "Water-meters." May 24.
12,858.—Riley, R., "Chandeliers for incandescent gas-lights." May 25.
12,877.—Dunn, M., and Mott, W. J., "Varying the speed of gas-exhausters." May 25.
12,900.—Manning, G. E., "Chimneys for gas or oil burners." May 25.
12,923.—Schülke, J., "Burners for acetylene gas." May 25.
13,000.—Crowther, A. W., "Composition mixture or cement for lining, mending, or renewing gas-retorts, furnaces, and the like." May 27.
13,081-2.—Dresser, F., "Generating acetylene gas." May 27.
13,085.—Tilley, F. A., "Gas-fire lighter and boiling-stove combined." May 27.
13,092.—Allsop, R. O., "Starting gas-engines." May 27.
13,095.—Borchardt, H., "Automatic gas-lighters." May 27.
13,103.—Smith, F. H., "Manufacture and use of calcium carbide." May 27.
13,113.—Spiel, J., "Incandescent light or bunsen flame wick burners for liquid fuels." May 27.
13,161.—Calloch, C. E., "Internal combustion engines." May 27.
13,191.—Bartlett, F. G., "Burners for incandescent gas-lighting." May 28.
13,197.—Bowden, W., and Urquhart, R. J., "Internal combustion engines." May 28.
13,282.—Lewitzki, L. V., "Electric igniter for gas-burners." May 28.
13,283.—Rowan, T., "Street gas-lamps." May 28.
13,325.—Letombe, L. A., "Gas-engines." May 29.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Economy of Mechanical Stoking at the West Bromwich Gas-Works.

SIR,—In the condensed notice of the report and accounts of the West Bromwich Corporation Gas-Works which appeared in the last number of the "JOURNAL," I notice one passage which appears to require some explanation, to prevent a wrong inference being drawn therefrom. The passage I refer to is the one dealing with the saving effected by the use of mechanical stoking; and it reads: "The introduction of mechanical stoking resulted in a reduction of 3½d. per ton in carbonizing wages." I have to point out that this comparison of saving was with the previous year, when the machinery had been in use for some months. A comparison with the year 1895, when hand stoking only was in use, and allowing for the stoking which has still to be done by hand, shows a gross saving of 6½d. per ton; or, after deducting interest and depreciation, about 5½d. per ton for work done by machinery. I may add that this result, along with other economies effected in the process of manufacture during the past two years, has given considerable satisfaction to the Gas Committee.

West Bromwich Gas-Works, June 3, 1897. THOS. GLOVER.

The Recovery of Cyanogen Compounds from Gas.

SIR,—In reply to Mr. Harman's letter in your issue for the 18th of May, respecting the quantity of hydrocyanic acid present in crude coal gas, I may state that the figures given in the paper referred to represent the average quantities in the gas as ascertained by myself, combined with the results obtained by two other experimenters. I have investigated the results obtained in three Continental gas-works, and find that the quantity in the gas as it *leaves the retort* ranges from 100 to 145 grains per 100 cubic feet, which corresponds to about 4¼ lbs. to 6¼ lbs. of crystallized ferrocyanide of sodium ($Na_4FeCy_6 + 10\ H_2O$) per ton of coal carbonized. My own observations tend to prove that high temperatures produce the greatest yields of cyanogen; but there are other conditions which also exercise a modifying influence, such as the duration and thickness of the charge of coal in the retort. M. Perthuis, of Nantes, has made some very interesting experiments upon this point. The following table compiled by him gives the yields of hydrocyanic acid produced at different periods during the carbonization of a charge of coal, and clearly indicates that it is almost entirely produced in the later stages of the distillation:—

Period of Distillation.	Hydrocyanic Acid in Grains per 100 Cubic Feet.
1 to 2 hours	Traces
3 „ 4 „	33
5 „ 6 „	61

The charges in carbonizing ovens are at least 15 inches thick, and take something like 48 hours to burn off. The outsides must therefore be completely distilled long before the inner cores; and so the gas from the interiors must pass through a considerable thickness of incandescent carbon, and should result in a high yield of cyanogen at a low temperature of carbonization. Consequently, any deductions based on relative "heats" employed in the two systems may be very erroneous.

In reply to Mr. Beilby's letter, in your issue for May 25, with reference to the cost of recovering cyanogen as a ferrocyanide from crude coal gas, I find, on looking through my estimates of the cost of production, that they work out to from 1¼d. to 1⅜d. per pound of ferrocyanide of sodium, or within a small fraction of the figures given by him. The cost of manufacturing ferrocyanide of potassium I estimate at 2½d. per pound. These figures do not take into consideration any charges for interest on capital, office expenses, or carriage to the point of delivery. Probable profit can be readily calculated from these figures if the market price is known.

The crude cake referred to by Mr. Beilby is, as I understand it, the product of a single evaporation of the crude ferrocyanide liquor, and sometimes contains 10 per cent. of insoluble iron, which tends to reduce its value. The product which I have been aiming to produce is a compromise between the crude cake and the refined crystals; and it should command a price more nearly approaching that of the latter than the figures quoted by him. Some little time before reading the paper referred to, I made a series of inquiries, with the view of ascertaining the market prices of various forms of cyanogen, with the result that the figures quoted were very divergent, particularly as between buyers and sellers; and since then the values appear to have declined to the extent of ½d. to ¾d. per pound. Consequently, the margin of profit assumed in the paper must be modified to this extent.

Mr. Beilby's letter raises some very interesting points in connection with the manufacture of cyanogen compounds, which I hope to be able to deal with more fully on a future occasion.

May 29, 1897. G. P. LEWIS.

[The above letter arrived too late for insertion last week.—ED. J.G.L.]

Middleton Gas-Works Profits.—The annual balance-sheet of the Middleton Corporation Gas Department shows a profit of £1158, as against £1350 in the previous year. The reduction is accounted for by the fact that last year the Gas Committee lowered the price of gas by 3d. per 1000 cubic feet.

Sales of Shares.—At the Mart, Tokenhouse Yard, last Tuesday, Messrs. Fox and Bousfield sold by auction some £5 new shares in the Clacton-on-Sea Gas and Water Company at £5 to £5 10s. each; and some £10 shares (7½ per cent.) in the Uxbridge and Hillingdon Gas Company, at £14 to £14 10s. apiece. On the same day, 52 £10 debentures in the Maldon Water Company, bearing interest at the rate of 4 per cent. per annum, were sold at prices varying between £10 5s. and £10 9s. each. A parcel of new ordinary 7 per cent. shares of £12 10s. each (fully paid) in the Salisbury Gas Company recently fetched an average of £20 17s. 6d. each. A number of £10 shares in the Airdrie Gas Company realized prices ranging from £19 10s. to £19 18s. 6d.; the average being £19 16s. 3d. each.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills down to the Whitsuntide recess:—

Bill read the first time and referred to the Examiners: Cirencester Water Bill.

Bill read a second time: Rhymney Valley Gas and Water Bill.

Bills read a second time and committed: Colne Corporation Bill, Llandudno Urban District Council Bill, Newark Corporation Water Bill.

Bills reported: Belfast Water Bill, Crowborough District Water Bill, Gas Orders Confirmation Bill (No. 1), Gravesend and Milton Water Bill, Luton Water Bill.

Bills read the third time and passed: Belfast Water Bill, Gas Orders Confirmation Bill (No. 1), Luton Water Bill, Swansea Improvements and Tramways Bill.

Bills Royal Assented: Ashford Urban District Gas Bill, Chichester Corporation Water Bill, Clackmannan (Alloa and Tillicoultry) Water Supply Provisional Order Bill, Cowes Gas Bill, Devonport Water Bill, Dumfries and Maxwelltown Water Bill, Edinburgh Corporation Bill, Huddersfield Corporation Bill, Loughborough Corporation Bill, Paisley Water-Works Provisional Order Bill, Perth Improvement Bill, Taunton Gas Bill, Torquay Corporation Water Bill, Tynemouth Gas Bill, Weymouth Gas Bill.

Petitions have been presented against the Colne Corporation Bill and the Nottingham Corporation Water Bill; also against the Gas Orders Confirmation Bill (No. 2), in respect of the Market Harborough Order.

HOUSE OF COMMONS.

The following further progress has been made with Bills down to the Whitsuntide recess:—

Bills read the first time and referred to the Examiners: Belfast Water Bill, Gas Orders Confirmation Bill (No. 1), Swansea Improvements and Tramways Bill.

Bills read a second time: Eastbourne Water Bill, Fylde Water (Transfer) Bill, Hunstanton Water and Gas Bill, New Hunstanton Water and Gas Bill.

Bills reported: Carnarvon Corporation Bill, East London Water Bill, New River Company Bill, Weymouth Water Bill.

Bills read the third time and passed: Bolton Tramways and Improvement Bill, Cirencester Water Bill, Local Government Provisional Order (Gas) Bill.

A Bill to amend the Electric Lighting Acts was presented and read the first time last Tuesday.

The Borrowstounness Water Provisional Order Bill, the Duntocher and Dalmuir Water Provisional Order Bill, the Harrogate Corporation (Water Transfer) Bill, the Harrogate Water Bill, the Newhaven and Seaford Water Bill, and the Tynemouth Corporation (Water) Bill have been referred to a Select Committee consisting of Sir W. Coddington (Chairman), Mr. G. Lambert, Mr. C. Morley, and Mr. Wingfield-Digby; to meet on Monday, June 28.

Petitions against the Fylde Water (Transfer) Bill have been presented from the Fylde and Garstang District Councils, and from the Fylde Water Company and their officers and servants.

HOUSE OF LORDS COMMITTEE.

Friday, May 21.

(*Before Lord* HAWKESBURY, *Chairman, Lord* BARNARD, *Lord* NAPIER OF MAGDALA, *Lord* BARRINGTON, *and Lord* CHELMSFORD.)

STIRLING BURGH GAS BILL.

This Bill, which was to authorize the Burgh Commissioners of Stirling to acquire the undertaking of the Stirling Gas Company, construct additional works, and supply gas within the burgh and adjacent places, came before the above-named Committee to-day.

Mr. LITTLER, C.B., Q.C., Mr. FORBES LANKESTER, and Mr. J. WILSON, appeared for the promoters; and Mr. BLENNERHASSETT, Q.C., and Mr. J. TODD represented the petition of owners and occupiers of property, ratepayers, and inhabitants in the burgh of Stirling in opposition.

Mr. FORBES LANKESTER said this was a Bill to authorize the Commissioners of the burgh of Stirling to purchase, and the Stirling Gaslight Company to sell to the Commissioners, the gas-works undertaking of the Company; and to authorize the Commissioners to construct and maintain additional works and to supply with gas the burgh of Stirling and places adjacent. The population inside the burgh had of late years been markedly increasing; the number of inhabitants according to the 1891 census being 16,796, while the present population was estimated at 18,567. The population in the area which it was now proposed to supply was 22,500. The rateable value of the town was also rising; the figure in 1891 being £79,400, whereas now it was £87,765. The consumption of gas was increasing in proportion. The quantity consumed in 1887 was 48½ million cubic feet; in the year ending May, 1896, 62 million cubic feet; and up to the end of the current month, calculated on the present basis, the quantity was some 67 million cubic feet. This increase in the last year was at the rate of 7½ per cent.; and in the last ten years there had been an increase of 39 per cent. Assuming that the desirability of public works, such as gas and water, being vested in the local authority was admitted, he passed on to say that there were 18 towns in Scotland consuming annually over 60 million cubic feet of gas. Of these, 14 at present had the control of the works in their own hands. Kirkcaldy and Stirling were this year seeking that control. Coatbridge had a statutory Company, which it would be very difficult to deal with. The fourth town was Ayr, which had a Provisional Order with regard to electric lighting, which was being run in opposition to the local Gas Company, with some-

what disastrous results. Some of the opponents were saying that the Stirling Commissioners were in the same position as Ayr—that they had an Electric Lighting Order which they ought to try to work against the Gas Company. With regard to the Stirling Gas Company, he said it was not constituted under any of the Joint-Stock Statutes, but was merely a collection of co-partners, and therefore had no legal or statutory personality which could be recognized. The Company had carried on operations since 1826, and naturally had made large profits. Not being a statutory Company, they had been able, simply by employing revenue, and without going to Parliament, to extend their works and more than double their capital. They were now paying dividends of 9 or 10 per cent. on the increased capital. The present Bill was the result of agitation which was started in 1891, when, as Counsel was informed, the Company sought to raise the price of gas by 5d. per 1000 cubic feet. The delay arose out of the action of an enterprising company which sought to introduce electric lighting in the burgh—a move which was met by the Commissioners themselves obtaining, in 1895, a Provisional Order. Counsel then detailed at considerable length the proceedings from time to time in the town and in the Council, to show that the matter of the acquisition of the gas undertaking had been fully considered and discussed, not only by the Council, but by the burgh itself, and that it was the deliberate and practically unanimous wish of the town that the property should be taken over by the Local Authority. Mr. M'Gilchrist, of Dumbarton, a very skilled Gas Engineer, was consulted; and in November, 1896, he estimated the value of the works at £61,000 odd, as between a willing purchaser and a willing seller. Mr. M'Gilchrist strongly urged the town to effect the purchase then, as, by a comparatively small expenditure of money, the works could be made very much more valuable. Mr. Gillespie, the Company's own Engineer, gave the value of the works as £68,000. The matter was referred to Sheriff Lees; and he fixed the price at £62,697. It was on the strength of this agreement that the present Bill was before the Committee. Counsel, in conclusion, dealt with the petition, urging that ratepayers who alleged that they would be injured as ratepayers could not be heard against a Bill brought forward by their own Corporation; and, with regard to the owners, that as they did not allege they would be injured, they also could not be heard.

The point was argued at some length, and had not been settled when the Committee adjourned.

Monday, May 24.

On the resumption of the proceedings to-day,

The CHAIRMAN said the Committee were satisfied that the petitioners had *locus standi*.

Mr. FORBES LANKESTER then proceeded to deal with the petition, the chief objection of which related to clauses 27 and 28 of the Bill, under which a gas contingent guarantee rate, to meet any deficiency in the gas revenues, was proposed; and power was taken to assess therefor all occupiers of land and heritages within the burgh. This power was common in the case of every corporation raising money for a public purpose; and the object was that the money might be raised more cheaply. It was a rate leviable, not on property owners, but simply on occupiers and general ratepayers. The surplus or deficiency in revenue from year to year was to be dealt with by corresponding changes in the price of gas.

Mr. BLENNERHASSETT said that if there was a loss on the supply of gas, it must be met by the contingent guarantee rate, for which only the occupiers were liable.

Mr. FORBES LANKESTER held that his view was correct. Then the petitioners urged that the promoters might have proceeded under the Burghs Gas Supply (Scotland) Act of 1876; but the reason this course had not been followed was that the machinery under the Act was very elaborate. The procedure adopted was much more compendious, much cheaper, and very much more in the interest of the community, than the cumbersome and old-fashioned practice under the 1876 Act. With regard to the suggestion that the Burgh Commissioners should act upon their Electric Lighting Provisional Order, he pointed to Ayr, where the result of doing so had been disastrous. No one could say it was good policy to run such an Order in competition with a gas company; it was much more desirable that a corporation should have control of the gas supply. In conclusion, he asked the Committee to allow the Corporation of Stirling, in the discharge of their duty to the town, to acquire these works; the moment being favourable.

The following evidence was then called for the promoters:—

Mr. *James Thomson*, a coachbuilder, of Stirling, spoke to the advances the town had made in population, rateable value, &c., and stated the composition and methods of election of the Town Council. The Gas Company had been very successful since it was started in 1825, with a capital of £6000 in £1 shares. In 1845, a new Company was formed; but it was at once amalgamated with the old Company by a contract of co-partnery. In 1846, the capital was increased to 6200 shares nominally of £2 each. Various additions were made to the shares, till in 1878 they stood at 7443—the present number. In 1878, Mr. Laidlaw, of Glasgow, valued the works at upwards of £30,000; and in accordance with this valuation, a memorandum was placed on the contract of co-partnery increasing the nominal value of each share to £4, making the capital £29,772. Notwithstanding this large increase, the Company had paid about 9 per cent. dividends ever since. The shares had lately sold at slightly over £8 each. For years there had been irritation between the Town Council and the Company, both as to the price and quality of the gas. In 1874, the Company raised the price; and the Corporation at once moved in the direction of taking over the undertaking—offering 9 per cent. annuities on the nominal value of the capital. This was declined. In 1891, the Company raised the price again from 3s. 9d. to 4s. 2d. per 1000 cubic feet, which meant an increase of their profit on the supply to the town generally of £1100. They made some concessions, however, worth about £20 or £30, to the Police Commissioners in consequence of agitation. Witness was then taken at considerable length through the various arguments and proceedings which eventually culminated in the promotion of the present Bill. A Committee appointed to deal with the subject made inquiries, which showed that in other parts of Scotland great reductions in price had followed the taking over of the gas undertakings by the corporations. Thus at Hamilton the rate was reduced from 5s. to 2s. 1d. per 1000 cubic feet; in Kilmarnock, from 5s. to 3s. 1½d.; in Inverness, from 6s. 8d. to 4s. 2d.; in Dumbarton, from 6s. to 3s.; in Alloa, from 4s. 7d. to 2s. 10d.; in Dumfries, from 5s. 10d. to 3s. 4d.; and in Paisley, from 3s. 9d. to 2s. 6d. At the November municipal elections in 1896, there was a total majority in favour of the purchase, without taking a *plébiscite*, as had been suggested in some quarters, and at subsequent meetings of the Council, an agreement which had been come to with the Company for the taking over of the undertaking was confirmed. It was then decided to apply for the present Bill, to enable the agreement to be carried out. While the subject of the purchase was being discussed, a number of misrepresentations were made in a local paper regarding the position of the Company, which he had no doubt influenced public opinion in a wrong direction. He was unable to contradict these misstatements, owing to the fact that the negotiations with the Company were being conducted in private. He therefore did not think the people were fairly polled on the question. The Corporation first offered the Company £61,130 as the purchase money; this being in accordance with the valuation of Mr. M'Gilchrist. This was refused; the Company being advised that the value of the works was £68,000. The matter was then referred to Sheriff Lees for decision, with instructions not to go below the lower or above the higher of these figures. Eventually Sheriff Lees awarded, as the fair price, £62,697 10s. 11d. In the proceedings before the Sheriff, it came out that the average profits of the last seven years were £2563 8s. 1d.; but that the accounts included several sums applicable to capital expenditure, and not chargeable to revenue. Corrected on this basis, the average profit was brought up to £3200. The advantages of not proceeding under the Burgh Gas Act of 1876, were that they would not have known the price beforehand, that they got the Company to forego the usual 10 per cent. for compulsory sale, and that they were able to deal with a larger portion of the burgh. He believed it would be a great mistake to exercise the electric lighting powers before getting control of the gas, as they could be managed much less expensively together than in competition. As a business man, he had no doubt the present proposals were a good bargain for the town.

Cross-examined by Mr. BLENNERHASSETT: If the Bill were granted, the Corporation certainly intended to go on with the electric lighting scheme. The use of electricity tended to an increase in the consumption of gas. He was cross-examined to show that the Corporation, although requested to do so, did not place before the ratepayers all the information available on the question; but he maintained in general that the elections showed the feeling of the town to be in favour of the purchase. At one meeting of the Corporation, if three gentlemen—the ex-Chairman, a Director, and a shareholder of the Gas Company—had not voted, the resolution to buy the undertaking would have been lost by a majority of two. After this vote, opinion was so excited that a public meeting was held, at which a resolution was passed that, in consequence of the repeated refusal of the Police Commissioners to grant a *plébiscite*, they (the meeting) authorized the Ward Committees to arrange for public opinion to be ascertained by ballot, post-card, or such other method as might commend itself to them. A *plébiscite* was taken in this way, when, of 3219 voters on the roll, 2168 voted against the scheme. The Corporation, however, did not give way to the ratepayers, but referred the question of price to Sheriff Lees.

Mr. BLENNERHASSETT informed the Committee at this point, that his clients considered this a most extraordinary instance—the expression of a unanimous public opinion against a proposal on the part of the ratepayers who would have to bear the burden of it. This opinion had been clearly indicated by *plébiscite*, by meeting after meeting, and by a petition signed by over 1000 ratepayers, for whom he appeared. Witness evidently thought there had been a feeling in opposition, aroused by the local paper referred to, and by other reports. Since then, however, the facts had become known. If this were so, were the promoters willing to take a poll now, or to accept a suspensory clause deferring the operation of the Bill till the elections next November?

Mr. WILSON said the promoters had no power to make such arrangement. Moreover, the Company would not consent to the operation of the agreement with the Corporation being postponed.

Re-examined by Mr. WILSON: On the general question of purchase, Stirling was quite with the promoters. The *plébiscite* was only on the question of price. The reason no information was given to the public of Stirling was because negotiations were pending with the Company, and the effect would have been to put up the price. The undertaking could not have been bought if they had disclosed Mr. M'Gilchrist's statements.

Mr. *R. C. Millar*, chartered accountant, of Edinburgh, said he was engaged as the accountant witness for the Stirling Corporation in the reference before Sheriff Lees. He had gone through the accounts of the Company; and he found that there were several instances of capital being paid out of revenue. The balance of revenue for the year 1895-6 he made £2664; and on the average of the five years, it was £2750. The dividends had steadily risen; and the make of gas had increased 39 per cent. during the past ten years. The maximum day's make had also increased; it being 307,000 cubic feet in 1889, and 400,000 cubic feet in 1896. From 1846 to the present time, £25,038 had been expended on capital account out of revenue, which did not include £7655 for expenditure on meters. If the Stirling Commissioners borrowed enough to pay for the price of the works at 3 per cent., and repaid the whole in 50 years—that was, 1 per cent. per year—he had no doubt there would be a profit on the undertaking. Witness gave figures showing that the make of gas had steadily increased from 1891 up to the present time.

Cross-examined by Mr. BLENNERHASSETT: Before Sheriff Lees, he stated that since 1891 the number of consumers had diminished and the quantity of gas consumed had been fluctuating; so that it would not be fair to represent it as a steadily increasing business, though in the long run there might be an increase of gas sold. This was true now. Witness was taken through a calculation to show that, though the annual income of the Company was only £2750, the annual outcome to pay interest and sinking fund charges would be £2920; but he submitted that the latter figure was partly in respect of expenditure on additional works, which would not be sanctioned unless they were to be profitable.

Mr. *James M'Gilchrist*, of Dumbarton, said he was employed by the Stirling Police Commissioners to advise them in connection with the proposal to purchase the gas-works last June. He valued the works at £61,130. This valuation was presented to the meeting of the Commissioners on Nov. 30, when it was resolved to proceed with the present

Bill. He also prepared a report which he advised the Commissioners to keep private—not because he wished for the public of Stirling to be in the dark, but for obvious business reasons. When a price had been suggested on behalf of the Company, the necessity to keep the report private passed away. He then advised the Corporation to split the difference, if they could; but the matter went before Sheriff Lees, with the result already stated. In a number of cases which witness named of Scotch towns, the reduction in the price of gas on the Corporation taking over the undertaking was considerable. The average price in these towns now was 3s. 1½d. per 1000 cubic feet, against 3s. 4d. in Stirling. With the present improved methods of carbonization, he thought the profit of the concern would be even greater in the hands of the Corporation than in those of the Company. Even if there were no increase of consumption, the decreased cost of manufacture would give the profit. The cost of the plant necessary to do this was £6000; and the extra profit would be 2s. 6d. per ton of coal carbonized, giving an additional profit of about £800 a year, after providing a sinking fund to repay the £6000. The process also effected a saving by giving more coke; and more ammoniacal liquor would be obtained by improved means of washing and scrubbing. There would, however, be a slight decrease in the amount of tar produced. Under the new system, seven men could do the work of ten; so that there would be a saving in wages of 30 per cent., or about £232 10s. The chief economy would be in coal, which would represent £532. Having regard to all these things, he estimated the maintainable revenue of the undertaking at £3912 per annum—that was, taking the gas manufactured at 62 million cubic feet, though the amount in the year to June, 1897, was 65 million cubic feet—an increase which was likely to be maintained. As to the electric light, his experience showed that, as at Ayr, Coatbridge, and Aberdeen, its introduction was followed by an increased consumption of gas; and speaking generally, he was of opinion that if electric lighting were introduced, there would still be room for the gas consumption to increase in Stirling. Gas was being largely used as a motive power in connection with engines; and he anticipated that it would be still further employed for tailors' sewing machines, printing machines, engines in laundries, &c.. besides which there was the gas which the Corporation hoped would be used for cooking—a branch of consumption that the Company had not pushed at all. The Commissioners would have a monopoly in the supply of the districts outside the burgh which were scheduled in the Bill.

Cross-examined by Mr. BLENNERHASSETT: The success of a corporation taking over the gas supply depended on the price paid, and to some extent on whether the place was growing. When giving evidence before Sheriff Lees, he took the maintainable profit at £2728; and the number of years' purchase at 22½. As to depreciation, he found that the Company had spent 4d. per 1000 cubic feet on the upkeep of the works. The figure that was considered proper in England was 4½d. per 1000 cubic feet. He admitted saying before Sheriff Lees that the retorts were not up to present ideas; that the scubbers and washers were not equal to present requirements; that the purifiers were not arranged in proper order; that the Company's undertaking had not been conducted with the skill that other similar concerns had; and that the property was not in such good repair.

Mr. BLENNERHASSETT: You say the works are in bad condition. If these works had been kept in proper order, it must have been out of the money which went to pay dividends. Therefore that was paying interest out of capital; and if you base the value of the works on those dividends, you are counting the money twice over?

Witness: I am afraid I either do not understand your way, or you do not understand mine, because I am quite clear in my view of the matter. If they had spent more money on works, they would have earned a larger profit. Witness went on to say that he believed the Company earned every farthing they paid in dividend, and with a little more skill they could have earned a much larger price. He acknowledged that it was right to allow a few more years' purchase in the case of a statutory company. When he made his valuation, he was not aware that a portion of the land on which the coal-store stood belonged to the Caledonian Railway Company. He valued it on the assumption that it belonged to the Gas Company. At the reference, he said his price had nothing to do with the condition of the works, but with the question whether it would be a good thing or not for the Corporation; also that the Commissioners were in a position to pay perhaps a little more than the value of the undertaking, so as to attain the position of being purveyors of light. He himself was prepared to purchase the concern at the price named by the Arbitrator. The works, with certain exceptions, were in fairly good condition; and all that was wrong could be set right for £6000. It was a fact that the profit on residuals had materially fallen. The Company hitherto had not recovered the full products from the gas; they had not been taking the whole of the impurities out of the gas at the paying point.

Re-examined: Whatever was obtained for residuals, under the new method of working the price would be calculated on double quantity.

Mr. *G. R. Hislop*, Gas Engineer to the Paisley Corporation, said he was examined before Sheriff Lees, and gave it as his opinion that the maintainable profit was £2601; but after listening to actual facts, he increased the figure to £2704. He was of opinion that this profit could be greatly increased by comparatively small changes in the system of manufacture. About £6000 would be required to put the works into proper condition, which would include a regenerative system of firing the retorts. This meant economy of fuel and reduction of labour to a great extent. The saving on coal would be £650 per annum—that was, they would make so much more gas of the same candle power out of the coal. In other words, to produce as much gas as at present, they would need 1135 tons of coal per annum less. As to coke, that was at present cooled by water, and fired in a cold state; the result being a great loss in heat, and in the labour of taking it in and out every six hours. Under his (witness's) system—which consisted of a hopper under the retort, into which the hot coke was drawn directly—there was no water applied. The coke came out at a heat approaching whiteness; and it was dropped into the producer where it was to be converted into gas. Instead of cooling the coke with water and taking it out, it was dropped directly into the receptacle in which it was to be utilized for heating purposes, and converted into gas. Therefore the loss, instead of being 60 odd per cent., was under 25 per cent. The amount of coke sold would be twice as much as at present. The economy with regard to the coke would certainly amount to £354. Fewer retorts would be needed under the regenerative system; and there would be a reduction in labour of at least 33 per cent.—equal to £348. Then as to the retort plant. This wore out very quickly, in consequence of the frequent alternation of great heat and cold; whereas under the proposed system, the heat would be constant and continuous. The saving here he put at ½d. per 1000 cubic feet, which, on 62 million cubic feet, worked out at £64 11s. 8d. per annum. These four heads of saving represented a total of £1417, which would follow the introduction of the regenerative system. The washing and scrubbing plant was only equal to dealing with one-fourth of the requirements in mid-winter; the result being a very serious loss of ammoniacal liquor. He allowed £80 on this head. There should be another purifier, which would not only not require the lime to be renewed so often, but would save labour and give a considerable gain in illuminating power. This would be because of the increased purification; and the annual saving would be about £60 per annum. Adding these figures to the present maintainable revenue, the income of the Commissioners would be £4120, without considering any increased consumption. His system had been introduced in many places, and always with complete success. He went through a calculation to show that, after allowing for a sinking fund, the Corporation would be able to reduce the price of gas by 5d. per 1000 cubic feet, and still have a small margin. He agreed that experience showed that, following the installation of the electric light, the consumption of gas had increased instead of diminished. This had actually occurred at Ayr, Coatbridge, Glasgow, Edinburgh, and Leith. The consumption of gas, moreover, was likely to greatly increase in connection with cooking-stoves and for motive power. The proposed provision as to the guarantee rate was copied from the Burghs Gas Act of 1876, and was common in these Bills. He had, however, never known a guarantee rate called upon.

Mr. TODD, in cross-examination: Do you suggest that, knowing that by an expenditure of £6000 it was possible to secure 25 per cent. of profit upon the outlay, the Stirling Gas Company were never advised to adopt your process?

Witness: I do not suppose they were advised to adopt any process which is an improvement on the present. That is where the mistake lies. By the adoption of the system, 25 per cent. would be immediately gained.

Certain royalties would be payable to you?—There is only a small charge made in the first instance, and the matter is done with. There are no continuous royalties. Witness added that when before Sheriff Lees, he said £68,000 was an extravagant price; but that was according to the light by which he was guided at the time. The use of gas for cooking and heating seemed to be entirely neglected in Stirling; but it could be very largely developed.

Professor *A. B. W. Kennedy*, M.Inst.C.E., M.I.M.E., said in several towns the municipal authorities, who were the owners of gas-works, had adopted electric lighting; and the two worked very well together. In Glasgow and Aberdeen, the increase in gas consumption had been greater since the electric light was started than for several years before. No doubt, the reason was that a higher standard of illumination was attained. Often, too, electricity was used at the expense of oil-lamps; and people who used electricity for lighting were most ready to employ gas for heating and cooking. He had been consulted by the Stirling Corporation with regard to the electric lighting scheme; and in his opinion it was reasonable and proper for them to carry it out concurrently with undertaking the management of the gas supply.

Mr. *Thomas Currie*, Assessor of the burgh of Stirling, stated that it was his duty to make up the rolls of voters for parliamentary and municipal purposes. He had examined the list of the names of the persons who had signed the petition against the Bill; and he found that the great majority of the signatories were occupiers of low-rented houses; and that the petition generally only represented a small portion of the inhabitants and rateable value of the burgh. There were also a number of signatories who had withdrawn.

Mr. *Patrick Welch*, Solicitor, of Stirling, and Procurator Fiscal for the county, said he acted as Clerk in the arbitration between the Town Council and the Gas Company. He detailed the proceedings before the Sheriff, and said he could conceive of no more satisfactory process for bringing out the true value of the undertaking. He thought it was undeniably sound policy for the Corporation to take over the works; and from long experience in these matters, he believed the price fair. If the Corporation had taken the concern compulsorily, they would have had to pay far more than was now proposed. If the agreement were to fall through, the Company would be able to place themselves in the position of a statutory Company, and put the town in a much worse position in regard to gas than they occupied at present.

Cross-examined by Mr. BLENNERHASSETT: At the arbitration, Mr. Clyde represented the Corporation; and witness heard him say that, so far as the minimum price was concerned, he (Mr. Clyde) was dealing with the knowledge that the Council's hands were tied by the necessity of publicity and a formidable opposition to obviate the criticism they would have been entitled to make.

Mr. BLENNERHASSETT: Does that mean that, in consequence of the opposition which existed on the part of the ratepayers, it was not open to the Corporation at the inquiry to suggest any lower figure than Mr. M'Gilchrist's valuation as the proper price for the works?

Witness: I did not, and do not, understand it so. The Corporation had, on the recommendation of their adviser, made an offer of £61,000 odd. It would have been hopeless to have contended that the works were worth a smaller sum.

Mr. *James Johnston*, Chairman of the Stirling Gaslight Company, gave evidence as to the negotiations that passed between the Company and the Corporation relative to the latter buying the Company. In the course of these negotiations, the Company had some idea of getting an Act to place themselves in the position of a statutory company, but on the agreement being come to with the town that was not proceeded with. Mr. Gillespie valued the concern for the Company at £68,320; and he also told the Company that, by introducing the regenerative system, they could earn a good deal larger profit. The Company therefore refused the Corporation offer of £61,000, and the matter was referred to Sheriff Lees; all the shareholders expecting they would be awarded £2000 or £3000 more than was fixed. The Company were at no time anxious to force the sale. Witness paid £8 2s. 6d. for his £4 shares in 1891; and on the basis of the award, he would receive £8 10s. This was all the profit he would make. The Company could not agree to insert a suspensory

clause hanging the Act up until next November, when its operation would be dependent on the adoption or refusal of the Town Council then elected. If the shareholders were freed from the present proceedings, he thought they would endeavour to obtain a Private Act.

Mr. *Ebenezer Gentleman*, Secretary of the Gas Company, said at the beginning of 1896, when the negotiations commenced, Provost Kinross held 20 shares; Councillor Bayne, 15 shares; and Councillor M'Farlane, 20 shares—between them 55 shares, out of the 7443 on the register. Since the reference to the Sheriff, Mr. M'Farlane had bought about 137 shares.

Cross-examined: About the beginning of March, Provost Kinross bought another 10 shares, saying they were purchased with the money of a relative, and were not for his own use.

Mr. *David Chrystal*, Law Agent of the Gas Company, gave evidence that it was after Dec. 4, 1896, when the meeting of the Corporation took place at which it was resolved by 10 votes to 9 to proceed with the purchase, that Mr. M'Farlane bought the 137 shares referred to. The agreement for reference had then been entered into; so that whatever loss or profit was to arise after that date was to be determined by a neutral man—the Sheriff. Witness prepared the notice for the Gas Company for an Act of their own. This was merely hung up; and if the present Bill failed, he should embrace the opportunity of going on with it, if it offered. Obviously the Company, after the evidence as to the value of the undertaking, and having regard to the fact that nothing was allowed for compulsory sale in the award, would get more than the present price. He was opposed to the insertion of the suspensory clause.

Mr. *J. B. Smith* said he was present at his own cost, interested mainly as a consumer of gas, as a ratepayer, and as a local resident. He was interested to the tune of £20,000 in the contingent guarantee rate—if there was anything in it. The taking over of the gas concern was very much for the benefit of the town; and it was bad business for the shareholders that they had to part with so valuable a property on the proposed terms. The running of the electric light scheme was no obstacle. With regard to the opposition of the thousand petitioners, that was altogether the result of a scare—a feeling that the shareholders were suddenly about to acquire great fortunes out of the Commissioners. The *plébiscite* by post-card was taken; and the "Noes" poured in. But now that the real state of things was known, the petitioners were running away.

Mr. *George Christie*, formerly a member of the Stirling Town Council, and for nine years Provost, gave general evidence in support of the scheme.

Mr. *Andrew Colquhoun*, brewer, the Town Treasurer of Stirling, agreed as to the expediency of the works being acquired by the Corporation. From his experience of Stirling and of other neighbouring towns, he was strongly of opinion that they could raise the purchase-money at 3 per cent. or lower; and on his calculation the purchase of the works would, after allowing for sinking fund and all expenses, leave a profit of £992. As to the meeting of Dec. 4, when the resolution to proceed was carried by 10 votes to 9, by the aid of the three members who were also shareholders of the Gas Company, he said the really important meeting was on Nov. 30, when the proceedings were practically unanimous; the three gentlemen referred to being absent. After the meeting of Nov. 30, there were misrepresentations in the newspapers which, he thought, accounted for the alteration of opinion.

This concluded the case for the promoters.

Mr. BLENNERHASSETT then addressed the Committee for the petitioners; stating at once that he did not propose to call evidence, and submitting that the promoters had made out no case. Mr. M'Gilchrist fixed the price at £61,000; but he admitted in his evidence before Sheriff Lees that he had not considered the fact that a portion of the site of the gas-works did not belong to the Gas Company at all, but to the Caledonian Railway Company. He also admitted that he had paid no regard to the condition of the works (for which the Sheriff censured him); and further that he thought the Corporation would be justified in paying more than the true value of the works. Every one of these points utterly annihilated the worth of Mr. M'Gilchrist's valuation. Then came the reference to the Sheriff, who put the value at £62,000; his hand being tied by the fact that he could not go above £68,000, nor below £61,000. Moreover, Mr. Clyde, for the Corporation, also complained that his hands were tied, and that he could not put forward the true value of the works, which he evidently meant was lower than £61,000, because, in view of the opposition to the scheme, he would have to stand by the £61,000 afterwards. These facts, he contended, entirely disposed of Mr. M'Gilchrist's valuation, and invalidated and discredited the Sheriff's valuation, because it was impossible for the Sheriff to have the whole facts before him. Mr. Clyde could not say the value was less than £61,000, because he would at once have been open to obvious and unanswerable criticism. The evidence, Counsel held, showed that there would be a loss on the proposed transaction. It was asserted that, if the Corporation took over the works, the profit would be greater, but this depended on the evidence of gas experts, and was absolutely in the clouds. When taking over the gas-works, it was proposed to introduce the electric light; but it was a matter of common sense that Stirling—with no great works or manufactories, and with a population not increasing—could only pay a certain sum for lighting. If (say) £2500 was to be paid for electric light, it was absolutely impossible to expect anything like the same income from gas. Therefore he said that the gas supply would be entered upon under the most ruinous conditions. The guarantee rate—if it meant anything—meant that, if there was any loss, it should be paid by the ratepayers of Stirling; and as there was no power to impose a rate on the outlying districts, whatever loss resulted from supplying these districts must fall upon the unfortunate ratepayers of the burgh. From the first, the Commissioners had flown in the face of the ordinary law, which already provided, by the Burgh Gas (Scotland) Act of 1876, an extremely simple and cheap method of acquiring a gas undertaking. The reason they did not proceed under this Act was, he asserted, that it gave power to any thirty ratepayers to demand a poll, which was what they were afraid of. Arbitration also would have been cheaper. Counsel proceeded to argue that, under the provisions of the Burgh Gas Supply Act and the Municipal Corporations Funds Act, the Corporation acted illegally in promoting the present Bill without a previous poll of the ratepayers. Could anything be more significant of the town's opinion than, in the *plébiscite* that was taken, 2300 ratepayers out of a total of a few over 3000 voting "No" to the plain issue put before them, and only 146—a less number than the number of shareholders—voting "Yes"? Then, at the meeting on Dec. 4, which he contended was the important one, it was a curious fact that the resolution to proceed would not have been passed but for the votes of the three gentlemen who, besides being members of the Town Council, were also shareholders in the Gas Company. Having regard to all these facts, he submitted that, if municipal life and representation in this country were not to be degraded, if the general policy of the law both in England and Scotland was not to be completely set aside, there was but one course before the Committee—to say that the preamble of the Bill was not proved.

On the conclusion of Counsel's address, the Chairman asked for the suspensory clause that had been alluded to; and it was accordingly handed to him.

The room was then cleared. On the re-admission of the public,

The CHAIRMAN said: The Committee find that it is not expedient to proceed with the Bill.

Mr. BLENNERHASSETT then applied to have the costs of the petitioners allowed them; but the application was not granted.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Thursday, June 3.

(*Before Mr. Justice* ROMER.)

Incandescent Gas-Light Company, Limited, v. Marsden.

This was a motion on behalf of the defendant, who was committed on the 24th of April for contempt of Court by breach of the injunction granted against him, that he might be released from prison.

Mr. CARRINGTON said the defendant had made an affidavit in which he threw himself on the mercy of the Court, and said he had suffered in health from his incarceration (which was not denied), and that he had a wife and child dependent upon him.

Mr. WALTER, for the plaintiffs, opposed the application. He recalled the circumstances under which the defendant was committed, and read what was said by his Lordship on the occasion. Defendant in his affidavit said his home had been broken up, and his wife had had to take refuge with her mother. Affidavits had been filed in opposition by the tipstaff of the Court, and by Daniel W. Barnett, stating that when arrested the defendant attempted to bribe the tipstaff by the offer of £50, and afterwards of £100; that his wife had no mother, and was residing with her sister; and that she had told him that her husband was in good health, and that his furniture was still in his house.

Mr. CARRINGTON read an affidavit by Mrs. Marsden and her two sisters which contradicted Barnett's statements, and one by Marsden himself, in which he admitted that in the excitement of the moment he had offered money to the tipstaff to delay his arrest for a day or two. He apologized for it, and submitted that Barnett's evidence was not to be relied on.

His LORDSHIP said he thought justice would be done by ordering defendant's release at the expiration of 14 days; but he must pay the costs of the motion.

The Lanchester Gas-Engine Starter Patent.

In the Queen's Bench Division of the High Court of Justice last Tuesday, Mr. Justice Wright gave judgment in an action brought by Mr. F. W. Lanchester against Messrs. Richter and Green for damages for the infringement of a patent, and for an injunction. The plaintiff was represented by Mr. Moulton, Q.C., Mr. A. J. Walter, and Mr. J. H. Gray; but there was no appearance for the defendants. Plaintiff held a patent (No. 5479 of 1890) for an invention of a gas-engine starting apparatus. It was designed to facilitate the starting of engines in which an explosive mixture of air and inflammable gas was employed as the propulsive power. The object was accomplished by means of an opening in the cylinder which communicated with an expanding nozzle opening to an external flame. The opening closed automatically on the sudden increase of pressure in the cylinder. To start the engine, the external flame of the starter was lighted. Into the cylinder gas was then introduced, which, mixing with the air, passed out through the nozzle until the character of the flame showed that an explosive mixture had been formed. The gas supply was then cut off or reduced, and the flame passing back into the cylinder caused an explosion which started the engine. When a sufficient speed had been obtained in this manner, the starting apparatus was put out of gear, and the engine worked in the ordinary way. The breaches complained of were that the defendants had manufactured, sold, and offered for sale, in Northampton, gas-engine starting apparatus similar to that described in plaintiff's specification. His Lordship gave judgment for the plaintiff, and ordered an inquiry as to the damages and delivery up or destruction of the articles infringing the patent. He also granted the injunction prayed for, as well as a certificate of the breaches, and setting forth that the validity of the patent had been attacked.

Partners and their Gas Accounts.

At the Grays Petty Sessions last Thursday, Anne R. Potter and Joseph E. Potter were summoned for the non-payment of £19 due to the Grays Gas Company. Mr. C. Asplin, for the Gas Company, said that in October last Mr. James Potter and Mr. Joseph E. Potter took over business premises in High Street, Grays, from Mr. C. C. Potter, who until then was the tenant, and paid for the gas. The business was carried on as a partnership until the 7th of December, when James Potter died. Mr. Joseph Potter had remained in possession, and Mrs. Potter was administratix to her husband's estate. Both parties denied liability for the gas account; Mrs. Potter alleging a partnership, and her son denying it. Evidence was given as to the supply of gas; but the entry in the books was in respect of "Potter" only—there being no initials affixed. Mr. Woodcock, for Mrs. Potter, contended that his

client was not liable, and that no case had been made out against her. Under section 11 of the Gas-Works Clauses Act, 1871, there must be a written contract; and in the present case the contract was with Mr. C. C. Potter, and not with Mrs. A. R. Potter. When Mr. C. C. Potter's connection with the premises ceased, the Gas Company should have made a new contract, or come to a definite understanding as to whom they were to look for payment. Mr. Clinch, for Mr. J. E. Potter, said his client was not a partner in the concern in respect of which the gas was consumed. The money taken in connection with the business went to the separate account of the late Mr. Potter. The Bench made an order for payment against the estate of Messrs. Potter and Son, with costs £1 1s.; so that it is practically against both defendants.

A Bankrupt Lessee of Gas-Works.

At the Windsor Bankruptcy Court last Tuesday, before Mr. Registrar Last, the public examination took place of Mr. W. Walker, of High Street, Colnbrook, lately Lessee and Manager of the Colnbrook Gas-Works. The liabilities were about £100, and the assets £50. The debtor said he had the gas-works on a repairing lease at £50 a year; but in March last the Company took over the premises, and gave him a release. The cause of his failure was the excessive repairing work which had to be carried out; and the income he received from the consumers was not sufficient to pay for the laying of new mains. This was deplorable, as there was a large leakage of gas from the old ones; and this, of course, was all loss to him. He carbonized 200 tons of coal last year, which should have produced 2 million cubic feet of gas; whereas the shown consumption was only 600,000 cubic feet. The examination was closed.

An Incident of the Derby Gas Workers' Strike.

At the Derby Police Court, on Monday last week, Martin Delaney was summoned, but did not appear, for assaulting Richard Adams, a labourer at the Litchurch Gas-Works, Derby. The defendant, it was stated, was one of the men on strike. On the 26th of May, as complainant was crossing the London Road Bridge, defendant shouted, "This is one of them," and gave complainant a violent blow in the face; knocking his hat off, and causing him to fall with his back against a wall. It was further stated that the men on strike were in the habit of meeting the workers as they came from the Company's premises, and calling them blacklegs and other names. Defendant had previously been convicted for an assault under similar circumstances; and he was now sentenced to one month's imprisonment.

Misuse of Water by a Builder at Bristol.

At the Keynsham Petty Sessions on the 28th ult., John Nott, a builder, was summoned by the Bristol Water Company for using water other than for domestic purposes, he not having previously made an agreement with the Company authorizing this; and also for permitting other persons to take water from a tenement in Churchill Road, Brislington, supplied with water by the Company. Mr. Gerrish, on behalf of the Company, said defendant had for some few months been building houses in Churchill Road. He had agreed with the Company for the supply of water for building and finishing certain houses in the road; and these were duly completed. On Oct. 6 he signed an agreement for a supply of water in respect of a fifth house; the amount to be paid being 19s. 8d. In January of this year, that sum being unpaid, the supply was cut off; and the money had not been paid yet. On March 22 defendant called at the Company's offices and asked for a supply of water to one of his houses, No. 4, Churchill Road, for domestic purposes; and he signed a contract accordingly. He stated to one of the inspectors that he would be wanting water for building purposes for the houses he was erecting; but he was told this would not be provided until he had paid the amount owing. On March 23 the Company connected a domestic supply with No. 4; and on the 26th, two of the Company's inspectors saw men mixing mortar with water, and found the supply was being obtained from No. 4. On two other occasions, the same thing occurred. Evidence bearing out this statement was given; and the Bench fined defendant 20s and costs in each case.

The Disposal of Gas Profits at Batley.—The Batley Town Council last Thursday approved of recommendation of the Gas Committee to make a grant of £2000 to the borough fund out of the year's profits on the gas undertaking, and to take £5000 from the contingency fund towards paying the cost of erecting inclined retorts at the works.

Bradford Water-Works Expenditure.—The Water-Works Committee of the Bradford Corporation have decided to levy a special water-rate of 2d. in the pound. Such a rate has not been asked for since 1888; and the present levy is necessitated by the heavy expenditure on the Nidd Valley Water-Works, which at present stands at £1,300,000. The new rate will produce £8500; and this, it is calculated, will be sufficient to provide the sinking fund and interest on the borrowed capital.

The Water-Gas Poisoning Cases at Garston, Liverpool.—The Medical Officer of Garston (Dr. Fisher) has submitted to the District Council a report on the alleged cases of carburetted water-gas poisoning in the district—fifteen in number, of which two have proved fatal, while thirteen of the patients have recovered. The doctor states that the Liverpool Gas Company have not supplied him with the information he wrote for; and as he does not know the composition of the gas, he could not give a report under that heading. Probably, however, the gas supplied contained a large proportion of carbon monoxide, and possibly it was an unmixed supply of water gas; but to assert that as a fact would be tantamount to charging the officials of the Company with issuing dangerous gas without giving warning to their customers to see that their fixtures were right. Reports on cases have also been submitted from Drs. Cayzer, O'Hagan, Paterson, Groom, and Belcher. The Council have ordered that the whole of the documents shall be sent to the Local Government Board.

MISCELLANEOUS NEWS.

THE REPORT OF THE CHIEF INSPECTOR UNDER THE ALKALI ACTS.

As already mentioned, the Chief Inspector under the Alkali, &c., Works Regulation Acts, 1881 and 1892 (Mr. R. Forbes Carpenter), has issued his report for the past year. The number of works now registered in England, Ireland, and Wales under the Acts is 1074. Of these, 98 only are works decomposing salt, and so scheduled as alkali works, while the remainder carry on processes which are scheduled under the Acts of 1881 and 1892. These figures show a decrease of 3 alkali works, and an increase of 12 other works since 1895. There are also 125 works registered in Scotland, bringing up the total number of registered works to 1199. Concerning these a separate report is, as usual, presented to the Secretary for Scotland.

There is little variation in the number of processes under inspection. In the treatment of gas liquor, 42 were employed last year, as compared with 38 and 36 in the two preceding years; and in sulphate of ammonia manufacture, 380, as against 379 and 378. There were 5162 visits paid to works; and 4775 tests made. The gases escaping from the sulphuric acid chambers as sulphur trioxide amounted to 1·21 grains per cubic foot, as compared with 1·158 grains in 1895; the acidity of all chimneys, given as sulphur trioxide, being 0·803 grain per cubic foot, against 0·709 grain. There was only one case of obstruction last year; and proceedings were taken against the manager of the works (now closed). Circumstances occurred after the solicitors had entered the action which led to its withdrawal. It seems that, after the works had been passed for registration, on the basis of the plans supplied by the proprietor, the manager, by means of bye-pass pipes, prevented the inspector from examining the effluent gases in the discharge of his duty. The Chief Inspector remarks that it is much to be regretted that, after the publicity given to two previous cases, a third should have arisen; and he emphasizes the view expressed by his predecessor in office (Mr. A. E. Fletcher), that such conduct introduces a spirit "much at variance with the open-handed confidence that has generally been maintained between the inspectors and the manufacturers." In addition to the foregoing, there occurred five cases in which registration fees for varying periods were accepted by the Board in lieu of penalty for carrying on in unregistered works some of the scheduled manufactures; it appearing that ignorance existed in each case of the obligations of the Acts.

Turning to the portion of the report dealing with the production of ammonia, we find the following figures, which the Chief Inspector is able to give through the courtesy of manufacturers. They show the total quantity of ammonia produced in all forms in the United Kingdom, calculated on the basis of the salt most commonly manufactured, sulphate of ammonia:—

	1896. Tons.		1895. Tons.		1894. Tons.
Gas-works	127,498	..	119,645	..	113,634
Iron-works	16,511	..	14,588	..	10,075
Shale-works	37,822	..	38,335	..	32,891
Producer gas, coke, and carbonizing works.	9,078	..	7,083	..	3,448
Total	190,909	..	179,651	..	160,048

Mr. Carpenter remarks that the whole of the ammonia was not worked up into marketable form; a good deal being utilized in manufacturing operations, the principal of which is the ammonia-soda process, in which the quantity of ammonia used has augmented of late years, with the increase of the alkali made by this process. Doubtless with the gradual tendency to improvement in plant, and to the striving for perfection of working, the loss of ammonia per ton of soda-ash made has lessened; the latest estimates published giving the consumption of ammonia as 0·5 to 2 per cent. of sulphate per ton of 58 per cent. alkali. On the basis of the mean figure, this would involve the loss in manufacture for the year of the equivalent of 5395 tons of sulphate of ammonia. Then he points out that an increasing quantity of ammonia is being used in the manufacture of cyanides. He explains that, in compiling the table, he has taken considerable pains not to omit any source of ammonia known to him; his purpose being to show production, and not what is put upon the market.

With regard to the yield of ammonia from gas-liquor works, the Chief Inspector says there was reason to anticipate that the increase of recent years would not be maintained in the same ratio in 1896. The effect of the extensive adoption of carburetted water gas, in which no ammonia is produced, in connection with gas manufacture in many parts of the country, will, he thinks, make itself felt more in the course of the next few years; but he says that already the quantity of ammonia recovered from gas-works does not show the natural rate of increase corresponding to that of gas made, as it would if all the latter were derived from coal instead of being partly due to the interaction of incandescent coke and steam. He does not dwell on the much-controverted subject of whether greater risk of gaseous poisoning from leakage arises in consequence of the increased percentage of carbonic oxide in the composition of the mixed gases supplied; but he expresses the opinion that if, in cases of gaseous poisoning in private houses, the same remedy of inhalation of oxygen were as promptly applied as it has been in instances of poisoning by producer gas, probably some fatal results might be averted. In many large works making and dealing with producer or lime-kiln gases, a bottle of compressed oxygen, with reducing-valve and mouthpiece, is always in readiness; and several lives have undoubtedly been saved thereby. Mr. Carpenter directs the attention of medical practitioners to the paper on this subject read by Mr. Douglas Herman before the Society of Chemical Industry a short time since, and noticed in the "JOURNAL" for the 9th of February last (pp. 286, 290).

Passing on to deal with the question of the recovery of the residuals from coke-ovens, the Chief Inspector refers to the papers of Mr. J. H. Darby, of Brymbo, and Mr. Charles Hunt, of Birmingham,* read before the Institute of Mining and Mechanical Engineers and the Institution of Gas Engineers respectively, setting forth the excellent results obtained

* See "JOURNAL," Vol. LXVII., p. 1090.

from Semet-Solvay ovens. Mr. Hunt, it will be remembered, studied these from the point of view of a gas manufacturer, to ascertain what were the prospects of carbonizing coal in bulk instead of in ordinary retorts; and Mr. Carpenter says the conclusion appears to be justified that, under favourable circumstances as to quality and percentage of volatile constituents in the coal used, and as to situation for the disposal of the coke and the distribution of the gas, it would be profitable to employ this method; taking the gas before washing, as is customary, for extraction of benzol, for illuminating purposes, and enriching it with petroleum spirit if it were necessary to raise it beyond the 15 or 16 candle power the gas would already possess. Of course, the gas, after scrubbing, would require much more of this enrichment than would perhaps be commercially profitable. The proposal is still open to the drawback that, in such a combination of manufactures—coke of high class and illuminating gas of standard candle power—one or the other would be more apt to suffer in quality from the vicissitudes and irregularities attendant on all process work, than where either alone is the chief product. In South Wales, where the volatile constituents range from 15 to 16 per cent. in the coal coked in the Coppée ovens which are used in the large iron-works at Merthyr and Dowlais, it has not been thought of advantage to attempt recovery of bye-products. The Chief Inspector thinks, however, that a change may be effected, as by the introduction of coal-washing machinery the conditions are now so much modified that the opinion is gaining ground that the air admitted in the Coppée oven may be dispensed with without injury to the resulting coke; and in this event plant would soon be added for the recovery of tar and ammonia.

Mr. Darby, it may be remembered, has also been associated with Dr. Ludwig Mond in experiments on the use of Mond producer gas in the melting of steel. Mr. Carpenter points out, however, that while in the successful development of this form of recovery of ammonia from gaseous fuel all praise is due to Dr. Mond's acumen and persistence, Messrs. Young and Beilby, in Scotland, had already shown the lines on which success was obtainable, as shown by Mr. Beilby's paper "On the Production of Ammonia from the Nitrogen of Minerals," read before the Society of Chemical Industry in 1884.* From the combined retorts and gas producers, consuming 4 tons of dross or small coal daily, the gas from which heated 32 shale retorts, Mr. Beilby obtained from 90 to 100 lbs. of sulphate of ammonia per ton of coal used. The amount of steam injected was from 2500 to 3500 lbs. of water per ton of coal; the aim being that the fixed carbon should be gasified, half by air and half by steam. This shows, remarks Mr. Carpenter, what an amount of industrial success had at that period been attained. The drop in the value of ammonia led to the abandonment of the working of this plant. The idea, however, has not been allowed to die. Mr. W. Foulis, in his Inaugural Address to the Institution of Gas Engineers last year, after alluding to the research work of the late Professor Foster on the recovery, in the form of ammonia, of the nitrogen left in coke after carbonizing (in amount more than half of the whole nitrogen contents of the coal), mentioned various suggestions that had been made to carry into gas-works practice the improvements effected by Messrs. Young and Beilby in increasing the yield of ammonia from shale-oil retorts by passing steam through the resultant coke while it was still highly heated. One of these suggestions proposed that superheated steam should be blown through the coke in

Purifier No. 1.—Artificial Oxide.

—	First Run, 44 Days.		Second Run, 15 Days.		Third Run, 15 Days.		Remarks.
	Bottom Tier.	Top Tier.	Bottom Tier = Top Tier First Run.	Top Tier = Bottom Tier First Run.	Bottom Tier = Top Tier Second Run.	Top Tier = Bottom Tier Second Run.	
Sulphur extracted by carbon disulphide	20·20	5·20	7·83	15·45	18·20	13·33	During the second run, the air was reduced 50 per cent., and the steam increased.
Sulphur as sulphates soluble in water.	0·99	1·67	2·05	1·83	1·70	1·60	
Sulphur extracted by dilute acid, after treatment with carbon disulphide and water	0·25	5·13	1·56	0·84	0·12	0·29	During the third run, the air supply was equal to that in the first, and the steam supply slightly greater, but less than that in the second.
Sulphur in other forms of combination, by difference (probably FeS_2)	12·13		17·69	14·27	26·10	15·15	
Total sulphur	33·57	12·00	29·13	32·39	46·12	30·37	
Proportion per cent. of free to total sulphur	60·10	43·30	26·90	47·70	39·40	43·90	

Purifier No. 2.—Flitwick Oxide.

First Run, 12 Days.	Second Run, 12 Days.	Third Run, 17 Days.	Fourth Run, 19 Days.			Fifth Run, 9 Days.			Remarks.
			Bottom Tier.	Top Tier.	Average.	Bottom Tier = Top Tier Fourth Run.	Top Tier = Bottom Tier Fourth Run.	Average.	
Sulphur extracted by carbon disulphide	21·40	31·45	47·57	38·50	43·03	41·03	45·59	43·31	During the fifth run, the supply of air was reduced 50 per cent., and the steam increased.
Sulphur as sulphates soluble in water.	0·60	3·15	1·03	2·10	1·60	2·66	1·94	2·30	
Sulphur extracted by dilute acid, after treatment with carbon disulphide and water.	1·70	0·98	1·19	1·27	1·23	0·35	0·59	0·47	
Sulphur in other forms of combination, by difference (probably FeS_2)		5·33	1·80	2·54	2·17	2·83	1·95	2·39	
Total sulphur	23·70	40·91	51·65	44·41	48·03	46·87	50·07	48·47	
Proportion per cent. of free to total sulphur.	90·31	76·90	92·10	86·70	89·60	87·50	91·0	89·40	

ordinary retorts for a short time, after the carbonization process was completed; and Mr. Foulis stated that a process embodying this idea was in practical operation in works (not gas-works) he had had an opportunity of inspecting since his address was written.

We alluded last week to the tabulated results furnished by the Chief Inspector of the experimental working of oxide of iron purifiers with concurrent revivification by regulated steam and air admission, at the works of the Luton Gas Company. These tables we reproduce above. Comparing the results (with dried oxide) with those previously obtained, and given in the report for 1895, Mr. Carpenter points out that the mixed Flitwickand Irish bog ores yielded better results than the Flitwick when used alone; and that the artificial oxide in No. 1 purifier, though at first giving a very prolonged run without fouling, must have, at some stage, become overheated, with subsequent oxidation, and also with formation of bisulphide of iron, though no heating was noticed during working. It was only when it was thrown out that the oxide showed itself specially active, by firing taking place on the floor. The charred black appearance of the organic matter present confirmed this. Its working throughout showed continued loss of available sulphur. In the fourth run of the Flitwick oxide, the distillation plant was pressed; and there was evidence of loss of ammonia. The passage of this through the saturator and forward with the waste gases would account for the reduction in soluble ferrous and ferric sulphates noticed, and the return of available sulphur to its former proportions. The Engineer (Mr. W. R. Phillips), in order to lessen the chance of firing in the purifier, at one time increased the steam, and reduced the air supply from 1000 to 1200 cubic feet per 24 hours to half this quantity. He has now reverted to the original proportions of air. From another works, where the method of alternate downward revivification without steam is employed, the spells of work on each purifier being reduced to three hours, the Chief Inspector examined a sample of oxide in use—the lower portion of it working continuously for six months, the upper only having been renewed from time to time. This gave 55·66 per cent. of total sulphur, 9·86 per cent. being in combination, and 45·8 per cent. free sulphur (82·3 per cent. of the total)—both of these figures being calculated on dry weights.

The report contains, as already mentioned, the tabulated results of an examination of ammoniacal liquors from various sources—a research undertaken by the Chief Inspector, in the first instance to ascertain the relative proportions of carbonic acid and sulphuretted hydrogen to ammonia, as a measure of the efficiency of the scrubbing operation in a particular case, and subsequently extended to specimens of typical liquors from the different sources that occur in the works under inspection in England and Scotland, both as regards the scrubbing and washing efficiency and the distribution of the sulphur. For these tables, we must refer our readers to the report.

With regard to works for the distillation of tar, the Chief Inspector states that Mr. F. Lennard's continuous still, a description of which was given in a report by his predecessor, and reproduced in the "JOURNAL" for Sept. 25, 1894 (p. 604), has not as yet received from tar distillers the

* See "JOURNAL," Vol, XLIII., p. 1001.

attention it so distinctly merits. He remarks that the departure from old-established usage is so startling, and the ideas on which the plant is based are so novel, that time must perhaps be allowed for these to be weighed and criticized from all points of view. At the East Greenwich works of Messrs. Forbes, Abbott, and Lennard, the whole work of distilling the tar is done by two units of plant—the first dealing with 16,000 gallons, and the second (the last erected) with 24,000 gallons of tar in 24 hours. In the latter plant, Mr. Lennard has embodied the improvements suggested by the working of the first unit. Moreover, in the latter the heated pipes increase in diameter gradually from 2½ to 4 inches from the inlet (the coolest point) to the outlet at the hottest point. In this way he has met the difficulty of the increased friction of the expanded fluid, and is able to economize heat to an even greater extent than before; the temperature of the spent heating gases being below 400° Fahr. Without actually witnessing the conduct of the process, it is difficult to realize how absolute is the freedom from nuisance of any kind. The pitch is delivered in a constant stream, which can be cooled to any desired degree before appearing in the open on the pitch bays. The absolute amount of raw material in operation at any given time is so much reduced, that the risks of damage from fire, in case of fracture or leakage in any part of the apparatus, is far less than in the ordinary forms of still in use, which hold from 5 to 30 tons of material with an average of 10 to 12 tons of raw tar. There is, in addition, much less exposure of the apparatus to undue stress, as the heat to which it is exposed is initially so much less, and is so much more evenly graduated throughout. It has been argued, Mr. Carpenter remarks, that in the adoption of one unit of this apparatus, which would replace many stills of the old type, the objection of "putting all one's eggs into one basket" arises, and that in case of breakdown during a severe winter much loss and disorganization would result before repairs could be completed. To this it may be replied that the size of a unit of a plant is not a fixed quantity, but may be varied according to need; bearing in mind that the economy in labour and fuel cannot be so great in a unit of smaller size. Still, the collateral advantages of having two smaller units in place of one larger one may well be of superior weight. Though not yet adopted in England, one plant is at work on the Continent; and in Scotland the erection of another was proceeding at the date of the report.

The report closes with the rules adopted by the United Alkali Company for rescue appliances; and it is, as usual, accompanied by the reports of the District Inspectors. These will be noticed in a subsequent issue.

BIRMINGHAM CORPORATION GAS SUPPLY.

The Annual Report.

At the Meeting of the Birmingham City Council last Tuesday—the Lord Mayor (Mr. James Smith) presiding—the annual report of the Gas Committee, which was noticed in the issue of the "Journal" on the same day, was presented.

Alderman Pollack first moved that the profit of the year ending on March 31, amounting to £35,250, should be appropriated as follows: £25,000 to the improvement rate of 1896, and £10,250 to the improvement rate of 1897 on account of the amount estimated to be available for this purpose in the current year. Commenting on the report, Alderman Pollack referred to the extraordinary and hitherto unparalleled increase in the consumption of gas which was recorded last year. The consumption amounted to 4859 million cubic feet—an increase of 524 millions, or a little above 12 per cent., as compared with a 2¾ per cent. increase in the preceding year, and the average annual increase of 4 per cent. during the twenty years of Corporation management. The number of consumers who used less than 25,000 cubic feet per quarter had increased by 5½ per cent.; between 25,000 and 50,000 feet, 5 per cent.; and those using above 50,000 feet per quarter, 19 per cent. But for the laying down of the water-gas plant, which was completed in October last, and had since produced 236,000,000 cubic feet, or about 45 per cent. of the total increase of the year, the department would, he said, have been unable to keep pace with the consumption. The use of gas for motive power had been rapidly increasing of late years; and particularly so since new and cheaper gas-engines had come to the fore. Gas-engines of 50-horse power or more were now frequently installed. The 1610 gas-engines in use had an aggregate indicated horse power of about 22,000, or an average of 13½-horse power per engine; and they consumed, on an average computation, a total of more than 800 million cubic feet of gas per annum. Another source of increased consumption was that in connection with prepayment meters, of which 1996 were now in use; the gas consumed by them during the year being 21,863,000 cubic feet, or an average of 11,000 cubic feet per meter. The additional revenue derived from the larger sale of gas had been above £56,000; and the additional cost to produce it had been comparatively small, owing principally to the lower price of coal. The proportionately heaviest increase of cost had been under the head of repairs, maintenance, and renewal of works, on which they had spent £11,177 more than last year, which was not surprising considering the strain upon the works and the necessity for making every part of the plant available for use. The balance of revenue carried to profit and loss account had been £134,125, or about £10,000 more than it was last year; and it represented 6¼ per cent. on the capital of £2,180,000 at present employed in the undertaking. The balance would have been considerably larger but for the heavy reduction in the value of residuals, in connection with which there was a loss of something like £13,000 in respect of decreased revenue from coke and £5000 from ammoniacal liquor; the latter item, however, being nearly balanced by a gain of £4500 on tar. To this loss of £13,000 were to be added the losses on the revenue of the preceding year, which were: Ammoniacal liquor, £16,000; coke, £11,000—making a total loss for the last two years of £40,000. But for this fall in residuals, the surplus profit for the year would have amounted to £75,000, and would have enabled the Committee to recommend a much-needed reduction in the price of gas, which, however, for the present had to be postponed. The experience of Birmingham in this particular had been shared by other large undertakings. The Committee were, however, able to show an additional profit of £10,000; giving, after the payment of annuities, interest on loans, &c., a surplus of £35,250, with which the resolution proposed to deal by voting £25,000 to last year's improvement rate, and £10,250 to the credit of this year's rate, as an instalment of the amount estimated to be available—viz., £30,000. The report of the Committee set out fully the direct and indirect contributions of the Gas Department in aid of the rates; for, notwithstanding the statements he had frequently made to the same effect, there were some people who still believed that the sum contributed to the rates was only £25,000 a year. As a matter of fact, their contributions for 1896 amounted to £48,920, including the sum voted for the current year; and to this ought, in all justice, to be added the £3560 in aid of public and court lighting in districts outside the city, and which made them copartners in the undertaking. There were a few supplementary statistics which might be interesting. During the year, the amount of coal carbonized was 512,722 tons; and for water gas, 679,924 gallons of oil, and 5508 gallons of carburine were used. The quantity of gas made was 5819 million cubic feet, of which 4524 millions was supplied to private consumers, 56 million feet was used at the works, 279 millions was absorbed by public lamps, and the balance was represented by leakage. The greatest quantity consumed in 24 hours was 33,324,000 feet; and the heaviest week was 174,500,000 feet. The average illuminating power was 17·19 candles; and the average cost to the consumers, 2s. 2½d. per 1000 feet. The department has now 588 miles of mains, and 60,022 customers, besides lighting 17,297 public lamps. During the year, the residuals amounted to 259,000,000 tons of coke (of which 60,000 tons was used at the works, and the remainder sold), 5,567,377 gallons of tar, and 16,216,158 gallons of ammoniacal liquor. The turnover, being the amount taken to the bank, was £750,000.

Alderman Clayton, in seconding the motion, said it was gratifying that on this occasion the Committee were able to make a payment for the current year out of profits made in the year preceding; and he hoped the time would come when this would be the position of the whole amount contributed by the Gas Department.

The motion was adopted.

Alderman Pollack then moved that the report be approved. Referring to the production of water gas, he said that without it the department would have been unable to meet last year's demand for gas. He quoted the reports by Dr. Crum Brown and Professor Vivian B. Lewes, as to the groundlessness of the fears in which some people had indulged as to the deleterious effect of water gas. Professor Lewes affirmed that an admixture of 50 per cent. carburetted water gas with 50 per cent. coal gas was harmless; but the Gas Committee had no intention of using this proportion. When their water-gas plant was duplicated, the most they would be able to use, and that only in case of emergency, would be one-third of the output. So far, they had only mixed 9 per cent. of water gas with 91 per cent. of coal gas; and if they thought there was the least danger, they would not hesitate to modify the use of water gas or discontinue it altogether. But seeing that 25 other corporations or gas companies used it, and turned out 40 million cubic feet of it per day without complaint, he thought the public might very well feel assured of its absolute safety. Alluding to a suggestion that the Corporation should acquire the electric light undertaking, Alderman Pollack said he looked with the keenest interest and favour on the introduction of electricity, not only because it was the means of stimulating improvements in gas lighting, but because of its intrinsic value and convenience. He might, however, mention that to produce sufficient electricity to displace only the increase in the consumption of gas in the last financial year would, according to present knowledge, require an outlay in plant and mains of a million of money, and would take several years to carry out. The two illuminants could peacefully progress and prosper side by side, in due proportions, without interfering with or superseding one another. Concluding, he mentioned that certain alterations in connection with the holidays and wages of the fitters had been effected. Difficulties between the Committee and the Incandescent Gas-Light Company had also been surmounted; and consumers could now be supplied with burners and mantles direct from the fittings department.

Mr. Lane said the capital account was, to his mind, a most mysterious arrangement; and he could not understand why it had remained stationary ever since the department took over the business of the old Companies. The capital account seemed to be getting smaller rather than larger; and he could not think it was a true statement. Turning to the revenue account, he could not understand the enormous amounts entered for repairs and maintenance. Year by year they were growing at a most alarming rate. During the last fifteen years, he found the items had increased fifteen times as fast as the production of gas. In 1892-93, they were charged on this account £44,514 for maintenance and repairs; in 1893-94, £63,976; in 1894-95, £87,430; in 1895-96, the amount went up to £90,863; and in the present account, it had further increased to £102,352. In the same years, the gas produced and sold had only increased about one-fifth. The Gas Department took credit for interest on the reserve fund of £100,000, but this had nothing to do with the year's trading. The reserve fund was built up five or ten years ago, and had remained stationary ever since. He concluded by moving an amendment calling for a supplemental report in reference specially to buildings, plant, &c., abandoned, £47,000 odd; with regard to the revenue account, £102,352 for repairs, maintenance, &c., and also as to the extensions of plant in the capital account.

Mr. E. Fletcher seconded the amendment.

Alderman Baker thought the Gas Committee were to be highly commended because they kept the capital account practically the same while the gas-rental had increased from £345,000 to £533,000. In view of the possibility of new processes being invented, and of the competition of the electric light, they had taken a very wise course in not piling up the valuation.

Mr. Beale said he had tried to make Mr. Lane understand these accounts; but, it appeared, absolutely without success. The capital account stood at the amount originally authorized simply because the Committee had never had to come to the Council for further capital. As to the buildings and plant abandoned, he would explain this by an illustration. When the water-gas plant was put down, certain land had to be used which was occupied by old plant; and the value of this plant had to be written off the capital value of the concern. Every transaction of the kind was summed up in the amount mentioned by Mr. Lane. The amount written off was in each case charged to revenue. Unfortunately, they were bound by Act of Parliament to keep the

accounts in a certain form, which was somewhat clumsy; but there was no mystery about them.

Mr. HENNESSY supplemented Mr. Lane's criticism of the accounts; and pointing to the variations in the amounts placed to maintenance and repairs during four years, urged that the Committee were thus able to manipulate the figures so as to show any profit they wished.

Mr. CLAYTON said, having looked at these accounts year after year, he thought they were such as any manufacturer in Birmingham might be proud of. Such a large increase of production without an increase of capital, with no piling up of goodwill, was no doubt a matter rather difficult to understand. To his mind, however, there were few financial statements put before the public which gave a clearer view—allowing for the fact that they were tied down to a certain form by Act of Parliament. He unhesitatingly said it was a shame and a disgrace for anybody to get up in the Council and suggest that there was an intention to deceive the inhabitants of the city with regard to the accounts.

Alderman POLLACK, in reply, suggested that Mr. Lane did not take cognizance of the fact that in the years when the maintenance had been much less than at present, the price of coal was so high that they were unable to put by any sum for depreciation at all; and this accounted for the small amount in 1892 and 1893. In one year, there had been no depreciation whatever; and in 1893 only one-half of the usual depreciation. The Committee might in that year have increased the price of gas to cover it; but they did not want to do so. As to the reserve fund, it was the property of the Gas Department; and they were fairly entitled to take credit for the amounts they contributed to other departments.

The amendment only received three supporters; and the motion was then put and carried.

SALFORD CORPORATION GAS & ELECTRIC UNDERTAKINGS.

At the Meeting of the Salford Town Council last Wednesday, the report of the Gas Committee for the twelve months ending March 25 was adopted. It stated that there had been an increase in the business of the department during the year; the output of gas being nearly 4½ per cent. more than in the previous year, and the receipts for residuals had been better. The cost of coal had been slightly more; but the illuminating power of the gas had been higher—the average being equal to 18·92 candles. The working expenses had been less; and the total result of the year's operations was very satisfactory. The quantity of coal and cannel carbonized was 126,259 tons; and the amount of gas made was 1,298,201,000 cubic feet. The demand for electric current had increased considerably during the year; and the Committee in December last reduced the charges from 6d. to 4d. per unit for lighting, and from 4d. to 2d. per unit for motive power. As this was an exceedingly low price, it was anticipated that it would induce a larger demand for current. The number of lamps equivalent to 8-candle power now connected with the mains was 11,467.

LABOUR GRIEVANCES AT THE STOCKTON GAS-WORKS.

New Retort-House Regulations Agreed Upon.

At last Tuesday's Meeting of the Stockton Town Council, the Gas Committee reported that a Sub-Committee had met deputations from the Union and Non-Union men employed at the gas-works with reference to grievances with regard to their employment; and that regulations for the workmen employed in the retort-houses had been drawn up. The Gas Manager (Mr. William Ford) presented the following report upon the scheme proposed to the conference; and the Committee recommended the Council to adopt it with the slight modifications suggested by the Manager: (1) That the employing, suspending, and discharging of all men employed at the gas-works be by the authority of the Manager for the time being.—This regulation has been the general practice during the past; and, in my opinion, meets the requirements of the department. (2) The appointment of foremen to be in the hands of the Manager.—This also has been the responsible duty of the Manager during the past, and should, in my opinion, remain as before. (3) That seniority of service be the conditions through which men shall from time to time be employed, suspended, or discharged as stokers in the retort-house.—This suggested regulation I would propose be altered to read as follows: "In the future seniority of service and suitability for the class of work be the conditions upon which men shall from time to time be appointed as stokers for work in the retort-house." This has been my general method of employing men as gas stokers during the long period of my service under the Gas Committee. (4) Any workman employed at the gas-works shall render himself liable for dismissal through insubordination, inefficiency, drunkenness, or wilful neglect of his duty.—This has been also one of the unwritten rules during the past. (5) When a stoker has finished in the retort-house, and is employed in the yard or on any other part of the works, he shall be employed, discharged, or suspended according to the discretion of the Manager.—Approved. (6) Any stoker discharged or leaving the works on his own account, if he seeks employment again as a stoker, he shall not be put above the older hands.—Approved. (7) That holidays be given to the stokers according to the following scale: Men employed in the retort-house 12 to 16 weeks, one day; men employed in the retort-house 16 to 20 weeks, two days; men employed in the retort-house 20 to 25 weeks, three days; men employed in the retort-house 25 to 30 weeks, four days; men employed in the retort-house 30 to 36 weeks, five days; men employed in the retort-house 36 to 44 weeks, six days; men employed in the retort-house 44 to 52 weeks, seven days.—It has always been the custom to give holidays to stokers during my connection with your gas-works; and I cordially approve of the scale set forth as above.

Alderman RICHARDSON, the Chairman of the Committee, moved the adoption of the minutes and scheme, and said he was pleased that the arrangement come to was satisfactory to all concerned, or nearly so. He believed the proposed regulations would conduce to harmonious working, and would save the time of the Council. As Chairman of the Committee, he had been ashamed over and over again to think that the time of the Council had been absolutely wasted over the gas-workers' question when it could have been very much better employed; and he hoped the result would be that, as long as he was Chairman, there would be no further difficulty, or time wasted by the Committee or the Council over the subject. He thanked the members of the Committee for loyally supporting the proposed changes.

Alderman BURN seconded the motion, which was carried.

DARLINGTON CORPORATION GAS SUPPLY.

Extension of the Works—Proposed Adoption of Water Gas.

At the Meeting of the Darlington Town Council last Thursday, the minutes of the Gas Committee contained a report by Mr. C. Hawksley on the extension of the gas-works; and it was recommended: (1) That a gasholder and tank, of a capacity of 1,250,000 cubic feet, be constructed on land recently acquired from the Darlington Forge Company, and that tenders be obtained for carrying out the work. (2) That the Gas Engineer obtain tenders for the following: Lengthening the present condensers, new engine and exhauster, and a new boiler; also for the necessary additions to the engine and boiler house. (3) That tenders be obtained for the laying down of a plant for producing carburetted water gas of a capacity not exceeding 500,000 cubic feet per day; the cost to be paid out of revenue and spread over ten years.

Mr. BARTLETT, in moving the adoption of the minutes, said the Committee fully comprehended that they were asking the Council to take a rather important step. At the present time, the gasholder capacity was 951,350 cubic feet. On Jan. 9 they had the maximum, day's make of 1,350,160 cubic feet, or about 400,000 cubic feet more than they could store. In other words, there was only power to supply from the storage about two-thirds of the maximum day's make. Although the average daily production was not more than from 700,000 to 750,000 cubic feet, in regard to their provision they must aim at the maximum, and not at the average. The total make of gas last year represented something like 238 million cubic feet; but an increase was steadily going on, and in the ratio of the past would represent about 12 million cubic feet increase per year. [The BOROUGH SURVEYOR: This year it will be more than that.] At present the maximum power to make on the new side of the works was 1,188,000 cubic feet, and on the old side 320,000 feet; or in round numbers, 1,500,000 cubic feet a day. One day they reached 1,350,000 cubic feet; and in view of the increase going on, the condition of things had claimed, and had had very close attention on the part of the Committee. As to the prospective make, in all probability the maximum demand for the coming winter would represent no less than 1,458,000 cubic feet on a maximum day. Looking to the next winter, the maximum demand on the one hand and production on the other would meet within about 49,000 cubic feet; and this was all he need say to show the urgency of the steps to increase the productive capacity of the works, as well as the reserve of storage power. The report of Mr. Hawksley was in respect of about £30,000 altogether. About £10,000 of this was already being spent; but it did not include the provision for making extra gas. The cost of providing plant on the old method would be more than double that for carburetted water-gas plant; and there were other disadvantages which decided the Committee in looking to water gas as the most sensible way of increasing the supply. They had ample room in the old retort-house in which to place the apparatus. The cost would be from £4000 to £5000—probably less; but he was giving the outside figure. The proposal was to spread the payment over a period of ten years, which would represent about £500 a year; and he thought the Council would be well advised to adopt the recommendation.

Mr. STEWART seconded the motion.

Mr. BARTLETT, replying to a question, said the ground the Local Government Board took in refusing to give the Stockport Corporation a Provisional Order to empower them to put down water-gas plant was that they had not hitherto given permission upon similar applications; preferring that sanction should be obtained by Act of Parliament, on the ground that water gas contained greater elements of danger than coal gas. But a mixture of coal gas and water gas up to 50 per cent. was quite safe; and the Committee only recommended 25 per cent. It was quite true that Mr. Hawksley recommended the Corporation to adhere to Messrs. Cutlers' system, and considered the saving by its adoption would be something like £1500, less the amount of royalty that Cutlers charged to other people for making the holder.

Alderman HARDING moved that the question be referred to the General Purposes Committee. In the case of Stockport, the Local Government Board Inspector stated distinctly that the Board would not entertain water gas because it was a question of danger to life.

Mr. BARTLETT: I understand that was not the case.

Alderman HARDING said it was very difficult to go against the opinion of an eminent man like Mr. Hawksley on a matter of this kind; but he thought there had not been a sufficient number of experiments to warrant them in entering into expenditure for water gas. They had at present a gas-making capacity of 1,500,000, and a maximum demand of 1,350,000 cubic feet; so there was a margin of 150,000 cubic feet. The average demand was only 750,000 cubic feet. Then it was proposed to erect additional storage, which would bring up the capacity to some 2¼ million cubic feet; so that they had a very large amount of reserve to fall back on in excess of any one day's supply. Under these circumstances, he thought they would do well not to commit themselves to the manufacture of carburetted water gas. The first feeling one had was that, if the Government authorities hesitated, with all the experience they could bring to bear, they ought to be very cautious indeed.

Mr. MANSON seconded the amendment.

Alderman J. J. WILKES took exception to the adoption of an entirely new process after only a few minutes' discussion, because they had information from various towns that water gas was of a dangerous character. He did not see the slightest necessity for "rushing" the question.

Mr. OLIVER did not think, seeing that a large number of towns had adopted the system, that the Committee could be charged with rushing the matter.

Alderman SEDGWICK was quite satisfied that the matter ought to be deferred for further consideration, because he thought Alderman Harding had clearly shown that there was not that pressure upon them that Mr. Bartlett would try to make them believe.

Mr. BARTLETT said the Gas Committee had had the matter under consideration for two years, and believed it was entirely free from such absurd experimentalism as had been suggested by Alderman Wilkes. But if the Mayor could arrange for an early meeting of the General Purposes Committee, probably no harm would occur.

It was then agreed to refer the whole matter to the General Purposes Committee.

ST. HELENS CORPORATION GAS SUPPLY.

A Successful Year's Working—Reduction in Price.

The minutes presented by the Gas and Lighting Committee at the meeting of the St. Helens Borough Council last Wednesday included a statement as to the results of the working of the department during the past financial year. It showed that the net profit on the gas-works during the year had been £4629, £2000 of which was to be handed over to the borough fund and £2629 placed to reserve. The minutes also contained a resolution reducing the price of gas from 2s. 7d. to 2s. 6d per 1000 cubic feet, and increasing the amount allowed for each penny by the coin-meters.

Alderman COOK, in moving the adoption of the minutes, said they had had a fairly good year at the gas-works. They had made 256 million cubic feet of gas, against 230 millions in the previous year; being an increase of 11·15 per cent. During the twelvemonth, they had added 653 new consumers; and at the present time, they had 5948 consumers, against 5208 in the preceding year. They had fixed 275 additional heating-stoves, and 540 cooking-stoves. They had now in use 1830 stoves, and 114 boiler-burners. The street-lamps now numbered 1531; 26 new ones having been erected. Financially the result of the year's work was that they had made a gross profit of £15,901, out of which they had paid for interest and sinking fund £10,363, and, in addition, had depreciated the meters and stoves by £908. These two deductions from the gross profits amounted to £11,271; and left a net profit of £4629. The previous year the net profit was £3846. He thought the Council would regard the year's results as very satisfactory, considering that they reduced the price of gas 1d. per 1000 cubic feet twelve months ago, which amounted to a reduction of £1000. They proposed to reduce the price 1d. for the current year, and also to give in the prepayment and coin meters 30 cubic feet for 1d, instead of 28 feet inside the borough, and 26 feet outside the borough, which reductions would be equal to about £1170.

Mr. BEECHAM seconded the motion.

Mr. LEACH congratulated the Committee on the results of the year.

Mr. GRIFFIN suggested that it would be far better if, instead of paying the £2000 into the borough fund, they were to reduce the price of gas to 2s. 5d.

Alderman COOK remarked that 56 per cent. of the amount they gave to the borough fund went to the gas consumers.

The minutes were unanimously adopted.

THE HULL CORPORATION AND THE KINGSTON-UPON-HULL GAS-WORKS.

The Purchase Bill Criticized by the Local Government Board.

The Local Government Board have passed the following criticisms on the Bill which has been promoted by the Hull Corporation to empower them to purchase the undertaking of the Kingston-upon-Hull Gas Company: There is nothing in the Bill to show whether or not the Company have any statutory powers, or whether they have any outstanding mortgage or other debt. It is very desirable that the undertaking should be transferred to the Corporation free from all debts of the Company; and the Board suggest that provision should be made in the Bill to the effect that the purchase-money shall include all debts of the Company, and that these shall be discharged by the Company. Under the clause as at present drawn, the consideration may be such as may be agreed on between the Company and the Corporation. The clause would therefore enable the Corporation to grant perpetual annuities or perpetual rent charges as consideration for the purchase of the undertaking, though it would seem probable from subsequent clauses that this is not the intention of the promoters. The Board submit that the clause should be modified so as to require the consideration for the purchase to be a sum in gross. Unless this is done, it will be necessary that the subsequent clauses should be modified, and provision made in the Bill for setting aside a sinking fund for the redemption of any annuities or rent charges that may be granted under the clause, and their compulsory redemption at a fixed number of years' purchase. It is very desirable that any special legislation relating to a gas undertaking in the hands of a local authority should, when practicable, be contained in one Act. The Board, therefore, suggest for the consideration of the Company the desirability of setting out in a schedule to the Bill the sections of the Company's Acts, if any, which it is intended should apply to the Corporation in the event of the undertaking being acquired by them, and that the remaining sections of the Act should either be repealed with the necessary savings, or be specified in another schedule as sections which are not to apply to the Corporation.

THE HAGUE GAS-WORKS.

Report on the Working for the Year 1896.

We have received the comprehensive report of the Committee of Administration of the Municipal Gas-Works at The Hague, on the position and working of the undertaking during the year 1896. We learn from it the following particulars:—

Heer J. E. M. Kros has retired from his position of Manager of the works during the year; but his services have been secured as Consulting Engineer. Heer J. E. H. Bakhuis, formerly of the Dordrecht works, has been appointed to the managership. The amount of coal carbonized during the year was 58,478 tons; and its average cost at the works was about 13s. 4d. per ton. Only Westphalian coal was bought. Carburine was the sole enriching material used. The expenditure on carburine amounted to about £1656 for the year. The gas made during the year was 17,735,221 cubic metres (626 million cubic feet); being an increase of 3·21 per cent. over the production of the preceding twelve months. This increase is less than that of previous years. The illuminating power of the gas, by tests made according to the "Instructions" of the Gas Referees of London, averaged 15·91 candles. The price to private consumers was 6 c. per cubic metre (2s. 10d. per 1000 cubic feet) throughout the year. The length of mains on Dec. 31 was rather more than 104 miles. An impost of 2s. 6d. per metre is handed over annually to the Municipal chest, for the use of the ground traversed by the mains. This sum amounted to £20,133 in the past year. The number of consumers at the end of the year was 13,581; and the population of the town was 191,529. Only 16 coin-freed meters were in use. There were 3683 public lamps, against 3499 in 1895; but the consumption of gas for public lighting was less than in that year. Of the public lamps, 651 were fitted with incandescent burners. Bye-products realized a little more than in preceding years, notwithstanding the fall in the value of ammoniacal liquor. There were 63 settings, comprising 492 retorts, on the works; and the retorts were charged six times in the 24 hours. The average amount of ammonia in the gas sent out was 2·7 grains per 100 cubic feet; and sulphuretted hydrogen was not present on any occasion. During two months, the removal of carbonic acid was very imperfect. A satisfactory feature of the year's working was the greatly reduced leakage account. The unaccounted-for gas amounted to only 5·66 per cent. of the make, against 6·58 per cent. in 1895, 7·14 in 1894, and 8·61 in 1893. The great improvement in this item, and the low price at which the gas is now supplied, speak volumes for the capable management of the undertaking. The report is, as usual, replete with information; and the Committee of many another municipal undertaking would learn a useful lesson by a perusal of it.

INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

The Annual Report and Accounts.

The report of the Directors of the above-named Company which will be presented at the tenth annual general meeting next Wednesday affords further striking evidence of the phenomenal development of the undertaking. The sale of 600,000 burners in the twelve months ending March 31, 1896—roughly 2000 for each working day—was not a bad record; but it has been beaten by that of the past financial year, when close upon a million burners were sold. The sales produced a revenue of £438,854; and £8891 was received for maintenance—making together £447,745. Deducting discounts, allowances, &c., £5376, the net receipts were £442,369. Purchases, less the value of stocks on the 31st of March last, came to £214,417; trade expenses to £37,252—together, £251,669—leaving a balance, being gross profit, of £190,700. The net profits amount to £118,861, to which is added £20,136 brought forward; making together £138,997. From this has to be deducted £23,578, the commission payable to the Manager and the Chemist; and a sum of £5505 which the Directors think it advisable should be written off the shares and fluid raw material accounts. The balance available for division, therefore, is £109,914, out of which an interim dividend of 1s. 4d. on each ordinary, and £2 10s. on each preference share, amounting to £25,942, was paid on March 22; leaving £83,972 available for final dividend. From this, £3937 is to be reserved as representing 25 per cent. of the 6 per cent. debenture issue and bonus, in accordance with the terms of the issue; and out of the balance the Directors propose to pay a final dividend of 1s. 5d. on each ordinary, and £2 14s. on each preference share. This will absorb £28,031; leaving £81 to the credit of the ordinary share dividend suspense account, and a balance of £52,003 will be carried forward. The Directors have carefully considered the question of the application of this sum; and they are agreed that it is not expedient, in view of the expansion of the business, to appropriate the whole of the profits to dividend purposes, but that it is in the best interests of the shareholders to establish a reserve fund, and thus provide the working capital required for the development of the business. In comparing the profits of the past year with those for the twelve months ending March 31, 1896, the Directors point out that last year's profits included £30,000 arising from the sale of the Irish licence, and £6250 accruing on the increased value of shares held by the Company. Against this £12,204 was written off patents; so that last year's accounts showed a profit of £24,045 outside the actual business earnings. Deducting this amount from the net profits of that year (£91,985), there remained £67,940, against £95,283 now, after eliminating similar items—in other words, an increase of about 40 per cent. on the net profits.

After referring to the successful results of the litigation undertaken by the Company to restrain infringement of their patents, the Directors remark that there are now two actions pending—one having been brought by the Company to restrain the New Incandescent (Sunlight Patent) Gas Lighting Company, Limited, from dealing in mantles constructed in infringement of a patent; and the other, an action brought by the Sunlight Incandescent Gas-Lamp Company, Limited, against the Incandescent Gas-Light Company, Limited, to restrain them from using a process for toughening the mantles, which they allege to be an infringement of the Rawson patent held by the Sunlight Company. The first of these actions will come on in due course. As regards the second, the patent in question having lapsed in September, 1896, the Directors say that the Company had from that date the full right to use the process, even should the result of the action prove that it infringed the Rawson patent while it was in existence. As regards this, however, the Directors have every confidence as to the ultimate result.

The Public Lighting of Sunderland.—The Electric Lighting Sub-Committee of the Sunderland Corporation have signed a contract with the Gas Company for the lighting of the town during the ensuing six months. For each lamp, £2 5s. 6d.—an increase of 1s.—is to be paid. Compensation at the rate of 10s. per lamp is also to be paid to the Company for all lamps displaced by the new scheme of electric lighting which the Committee have in hand.

ELECTRIC LIGHTING IN MANCHESTER.

Remarkable Development.

At Manchester last Thursday, Colonel T. Marsh, one of the Inspectors of the Local Government Board, held an inquiry relative to an application by the City Council for sanction to the borrowing of £130,000 for electric lighting.

Mr. T. Hudson, the Assistant Town Clerk, said the application was made as the capacity of the plant was not equal to the demand for the supply of the current at the present time. Speaking generally, the plant was equivalent to the requirements of 128,000 lamps of 8-candle power; and the demand down to May 20 for current was represented by 161,594 lamps—showing a deficiency of 33,594 lamps. The new works which were intended to be introduced consisted principally of two direct-driving electric generators of 2500-horse power each; six Lancashire boilers, five tubular boilers, and two economizers. In addition, there would, of course, be a very large outlay for mains in the streets. The total outlay up to March 31 had been £309,190; and the estimated cost of works which were included in previous applications for loans, but which had not been executed, was £40,809. These sums added together made a total, including the sum now asked for, of £480,000.

Alderman *Higginbottom*, the Chairman of the Electricity Committee, described the works at present in existence, which were on what was known as the five-wire system with continuous currents under the Westinghouse patents. Manchester was the first city or town in the United Kingdom to adopt the five-wire system. The current was first supplied in a compulsory area specified in an Order of 1890; a permissive area being also included. The demand, however, became so great, and there were such constant applications for the current outside the permissive area, that in 1896 a new Order was obtained, giving power to supply the current to the whole area of the city—viz., 12,911 acres, or nearly 20 square miles. In order that the Committee might be enabled to carry out the obligations and powers of the Orders referred to, application was now made for sanction to borrow another £130,000. The Committee had also entered into provisional arrangements with the adjoining districts of Moss Side and Levenshulme for the supply of current, which agreements had received the consent of the Board of Trade, and were only awaiting the sanction of Parliament. It was estimated that the expenditure upon buildings would be £13,000; machinery, £55,800; transformer stations, £15,300; mains, £33,500; meters, £2500; instruments, £500; and sundries and contingencies, £9400. In 1893 the capacity of the plant was equal to 40,000 8-candle power lamps; and they continued to increase until, on May 20 last, they had 1624 consumers, with 147,068 lamps. There were 52 consumers now awaiting connection, with 14,526 lamps. The plant being only equal to 128,000 lamps, there was therefore a deficiency of 33,594 lamps. Applications were coming in almost daily; and they were connecting lamps at the rate of 400 or 500 per week. It was impossible to measure future requirements, because requests for the current came from most unlikely places. If, in the centre of the city, they put a main in the street and had only one consumer, it seemed as though everybody in the street at once wanted the light. Comparing the returns ending March, 1897, with those up to March, 1896, the increased consumption of current was no less than 973,678 units; being an increase of 54 per cent. for the year. Such a rate of increase had not been known, he should think, in this country. The supply to consumers to the end of March, 1897, amounted to 2,775,107 units. The whole of the supply up to May 20 was for private purposes only; but on that date twenty arc lamps of 2000-candle power each were put down in Albert Square, Piccadilly, and Deansgate. The current was increasingly used in warehouses and works for lighting, for electric motors, and for driving hoists and various machines, and seemed to give general satisfaction to the ratepayers. There was no doubt a demand would be made upon the Corporation for the lighting of the public streets; and there was no question that, at the price at which it was supplied, it would be cheaper than gas. It was estimated that the lighting of the three squares he had mentioned would result in a saving of £80 a year as compared with the cost of gas. The current was supplied at the rate of 2d. per unit. Regarding the financial results of the undertaking, at the end of the first eight months, after providing for sinking fund, interest, and depreciation, there was a loss of £278; but at the end of the first complete twelvemonth (March, 1895), they had a net profit of £5709, and placed £4000 to the renewal fund. In March, 1896, the net profit was £11,139; and they placed £3492 to the renewal fund and £8521 to the contingency fund. In that year they also handed over £6954 to the city fund. For the year ending March, 1897, the returns were not yet out; but they had made a net profit of £16,812. They had carried £2307 to the renewal fund; £7965 to the reserve or contingency fund; and had promised to pay to the city fund £10,000. Witness explained the system of charging for the use of the current. There were, he said, two rates of charges, which were now (reductions having been made since current was first supplied) 6d. per unit and 1½d. per unit, with a fixed charge of 3s. per lamp installed. A consumer using the current for a number of hours would be charged at the latter rate. They were able to supply people using electric power for driving motors, hoists, or machinery, at 1½d. per unit, without any fixed charge. An application had been received from one firm to furnish power for machinery indicated at 300-horse power. They had complied with their obligations with regard to a sinking fund. Down to March, the fund amounted to £16,318; the reserve or contingency fund stood at £16,486; and the renewal fund, at £10,799.

Mr. *J. Pythian*, the Deputy-Chairman of the Committee, and Mr. *C. H. Wordingham*, the Electrical Engineer, also gave evidence.

The Inspector afterwards visited the electric lighting station.

Gas Consumption at Coventry.—The quarterly report of the Gas Committee of the Coventry Corporation states that the gas made during the year ending March 31 last was 504,754,000 cubic feet, as compared with 405,708,000 cubic feet in the preceding twelvemonth, which is an increase of 99,046,000 cubic feet, or equal to 24·41 per cent. The number of consumers on the same date was 6658, or an addition of 530; and the stoves on hire have increased by 227 to 1803.

DAMAGE TO THE PORT ELIZABETH GAS AND WATER WORKS.

After the prevalence of drought for some months, Port Elizabeth, Cape Colony, was visited, on Wednesday, the 5th ult., with a deluge which has scarcely been paralleled in the history of the colony. The first rain came on the previous Monday night, when the wind went round to the south-west, and masses of black clouds rose from the ocean. By Tuesday morning, gauges showed that about half an inch of rain to the square foot had fallen; but by the following morning this had increased to 1·34 inches. Towards eleven o'clock, the sky grew blacker to the west, and the rain began to fall heavily; and by noon every street in the town was inundated. Half an hour later, muddy torrents, in many places waist deep, were rushing down every slope of road or lane; the rain driving along in sheets, forming what a local paper describes as "a watery curtain" which no gaze could penetrate for more than fifty yards. After raging for about an hour, the storm abated with a shift of the wind to the north-east; and by half-past one the sun was shining in a clear sky. Such a waste of desolation in the leading thoroughfares of Port Elizabeth had never been seen. At noon the railway station was practically submerged; the water being up to the tops of the carriage-wheels. At one point, near the gas-works, the rush of water was so heavy that the ballast was washed away, and the line became impassable. The gas-works, too, felt the effects of the storm, as in a number of places the pipes were laid bare and broken; and, as the result, the Manager (Mr. W. Arnott) was unable to keep up the supply of gas to half the town on Wednesday night. Some idea of the extent of the downpour may be formed from the fact that, between eight o'clock on the morning of that day and two in the afternoon, no less than 5·32 inches of rain were measured; and when it is stated that in the ten years 1886-95 inclusive the highest amount of rainfall in any one year was 27·94 inches, and that in 1895 it was only 16·88 inches, the overwhelming nature of the storm will be appreciated. This extraordinary rainfall caused the water in the town service reservoir to rise to an abnormal level; and the great pressure caused thereby burst a main, which necessitated the cutting off of the supply. Further trouble was brought about by the sweeping away of the dam, pipes, and everything else, at the reservoir. So great was the strain upon the dam that it was washed away to its foundation.

SHEFFIELD CORPORATION WATER ACCOUNTS.

The General Manager of the Sheffield Corporation Water Department (Mr. W. Terrey) has issued his statement of accounts for the twelve months ending March 25. On the year's working, there is a net profit of £15,779; and after allowing the full amount for the sinking fund, the remainder makes the handsome surplus of £9557. Last year the net deficiency, owing to extra expenditure necessitated by the great frost of the preceding winter, was £3748; and this, of course, has to be deducted from the surplus. After discharging all liabilities, the department has £5809 in hand; and this will enable the Committee to remit, as promised, half of the extra 5 per cent. at the end of the present year. The following figures summarize the various accounts: Up to March 25, 1896, the total expenditure on capital account amounted to £2,220,359; and to this during the year there have been additions, chiefly the expenditure on the purchase of the Stocksbridge water undertaking, £10,427; on the Damflask wing trench, £4067; and on extension of pipes and new meters, £10,051—bringing the total up to £2,247,020. On the Little Don Valley works, the expenditure up to March 25 last (the principal items being parliamentary expenses, the purchase of the Langley Brook estate, and laying pipe-lines to Rotherham and Doncaster) amounts to £17,399. The revenue account is as follows: Income from water-rates for domestic and trade purposes, £110,383; and miscellaneous receipts, £5094—total, £115,477; being an increase of £5929, or 5·41 per cent. over the income for the previous year. The expenditure on maintenance and management amounts to £21,405—an increase of £536 compared with 1895-6. This leaves the net revenue at £94,072, on which there are the following charges: Annuities, £57,440; and interest on Corporation stock, £20,852—leaving a net profit of £15,779, as against a deficiency of £3748 in the preceding year. The ninth annual instalment set aside out of revenue for the redemption of annuities and the extinction of loan indebtedness—amounting to £6222—reduces the £15,779 to £9577; and this in turn is subject to the deduction of £3748 to wipe out the previous year's deficiency. Thus the net surplus on March 25 this year, after discharging all liabilities, including the instalment to the sinking fund, was £5809. The total amount now applied to the sinking fund out of revenue is £61,237. Appended to the statement of accounts are the following particulars: The number of houses supplied with water is 78,499; being an increase during the year of 2441. The number of water-closets supplied is 8106; and of baths, 4706. There are 3142 water-meters now in use, as against 2993 in the previous year. The grand total of all supplies on March 25 was 103,335, against 99,006 at the corresponding date last year.

At the Meeting of the City Council last Wednesday, the Water Committee submitted minutes, which included, among other items, a recommendation that Mr. A. A. Garside be appointed Assistant-Engineer for the new works in the Little Don Valley. It was also mentioned that a deputation, accompanied by Mr. Terrey and Mr. W. Watts (the Engineer) had visited the water-works which are being constructed by the Birmingham Corporation at Rhayader; and much information was gathered which will be useful in dealing with the matters to come before them in connection with the Langsett works.

Alderman Gainsford, in moving the adoption of the minutes, alluded to the accounts for the past year. In the first place, he said the result of ten years' control of the water undertaking by the Corporation was that a sum of £67,000 had been added to their credit, which would have been paid out in dividends to shareholders had the concern remained in the hands of the Company. During the last twelve months, the undertaking had earned £15,700; and after paying off all sinking fund charges, there remained a net profit of £9500. This was no doubt a record result in a year of many pleasant records. He thought they ought to recognize very distinctly and emphatically the debt of gratitude which was due from the

Council and from the town to the working staff of the Water Department, and especially to the gentleman who was at the head—Mr. W. Terrey. The city could not have such results as these unless they had the thorough confidence of the members of the staff. It would be agreed that two essential factors for the successful working of such a large undertaking were good and well-satisfied servants; it was of no use having good servants if they were not satisfied. He could not help thinking that the Corporation had been rather hard upon some of their servants in the department. Scant justice had been done to them sometimes; and particularly was this the case with regard to one of their servants in refusing him a small advance of salary some few months ago.

The minutes were adopted.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

It would have been too much to expect that the misguided men who bewitched the House of Lords Committee, and procured the rejection of the Stirling Corporation Gas Bill, should not at the moment indulge in a little crowing over their pitiful victory. But surely it was a reasonable expectation that, under the sobering influence of time, their minds would awaken to a sense of the mischief they have wrought; or that, at all events, having done the deed they banded themselves together to do, they would have been content to slip out of notice. Instead of this being their attitude, however, they, on Tuesday of this week, organized a public meeting of the Ward Committees—the irresponsible bodies who have been at the bottom of the whole of the difficulties. The meeting, it is reported, was largely attended; and at it the jubilation was high. A communication was read from the Executive of the Working Men's Liberal Reform Association—the members of which I suppose, are the Mr. Hydes to the Dr. Jekylls of the Ward Committees—in which they congratulated the Committees upon the success of their opposition to the Bill, and "deplored the action of Provost Kinross and his co-Directors of the Gas Company in trying to thrust the works upon the town." The Chairman of the meeting intimated that "every penny of their legal expenses had been paid;" but he hoped that the ratepayers would help them to reward, in a manner worthy of the great services they had both rendered, their Counsel (Mr. Blennerhasset) and their Local Agent (Mr. Henry Robb), and also that the outlays of their five representatives in London would be recouped. The Secretary to the Wards Joint Committee said they had still a large balance to the good. Several other speakers followed in the "shake-hands-with-yourself" style; and then a Committee was appointed to watch further developments of the situation, "especially in regard to the Police Commissioners and the expenses of their Bill." This having been done, votes of thanks were showered upon all and sundry who had had to do with the business, including two newspapers "for the able and spirited manner in which they had championed the ratepayers' cause." Such a farrago! It is really wonderful how neatly, when one does not wish to see a thing, one can shut his eyes to it. There was not one present at the meeting, or one of the opposition anywhere, but who had, in addition to the direct sworn testimony of the witnesses as to the advantage it would be to the town to own the gas undertaking, the evidence of his own eyes to the profitable nature of the business the Company have carried on. Where was the evidence of Provost Kinross and his co-Directors trying to thrust the gas-works on the town? Simply the vote in the Town Council. But this vote was given as a public representative; and, moreover, before you can reach a point even within view of corrupt motive, you must assume that it is in the nature of a man who understands business to part with a valuable investment when he might easily retain it. This point has not been reached here; and to insinuate it, is as near slander as may be. Then, what is the meaning of the passage about the remuneration of Counsel? It is capable of the interpretation that Counsel took up the case "on spec." But that is more than I can accept; and therefore I am driven back to the conclusion that it simply means that the leaders of the opposition have paid their money and want the ratepayers to recoup them for their disbursements. My experience of such a situation is that it requires a great deal of whistling to raise the wind. Perhaps in this circumstance there may be the better ground for hope as to the future. If the Corporation should resolve to proceed regularly, it is not to be expected that the same parties would care to dip into their pockets a second time to lead an opposition. The appointment of a Committee points to an effort to prevent the costs of the defeated Bill being paid out of the rates. The attempt will doubtless be made. If it were successful, it would be matter for regret. I am not in a position to say what the Corporation intend to do; but I had a conversation this week with Mr. Wilson (one of the Corporation Counsel), when he informed me that he had advised them to proceed with the adoption of the Burghs Gas Supply Act. Should they elect to do so, there is no reason to suppose that they would not carry the community with them, because there is nothing more damaging to any cause than the cry of interested motive, or of irregularity; and these would then be out of the way. I am not sufficiently acquainted with the rules of parliamentary procedure to be able to say whether it is feasible or not, but I understand there is under consideration a proposal to ask the House of Lords to recommit the Bill. But even if it were possible to recommit, the time is now so far spent that the Bill could not be got through this session.

The Edinburgh and Leith Gas Commissioners held a meeting this week. The report of Mr. Herring, the Engineer, showed an increased output of gas during April, as compared with the same month of last year, of 11 million cubic feet. The Works Committee recommended certain changes in the matter of wages, as follows: Gas-pipe labourers, an increase from 21s. 3d. to 22s. per week; bricklayers in permanent employment, in consideration of sick allowances and holidays conceded by the Commissioners, to receive 1d. per hour less than the standard rate of wages. Bailie Kinloch Anderson said the Commissioners had done what they could to assimilate the holidays in all departments; and they had now arranged that each employee should receive seven days' holiday a year, and his pay for that time. This would cost the Commissioners £348 a year. They had granted increases and holidays at this time to the amount of £891, which was equal to about ½d. per 1000 cubic feet on the price of gas. They hoped that these arrangements would be satisfactory to the staff. The proposals of the Committee were agreed to. It was remitted to the Works Committee to consider as to the method of paying workmen who might be absent temporarily through accident, and to consider the positions of the Assistant-Engineers in the Edinburgh, Leith, and Portobello works under the altered arrangements. Then Lord Provost M'Donald referred to the death of Mr. Mitchell, their late Engineer. He proposed that a minute expressive of their regret at the occurrence, and appreciation of his services, should be recorded, and a copy sent to Mrs. Mitchell. The proposal was seconded by Bailie Kinloch Anderson, and was approved of.

The accounts of the Perth Gas Commission for the past financial year have not yet been made up. But it is known that there has been a great increase in the consumption of gas; and the Works Committee on Monday resolved to recommend, in view of the improved business of the Commission, that the price of gas should be reduced from 3s. 6d. to 3s. 2d. per 1000 cubic feet. The recommendation is to come before the Commissioners at their first meeting.

A fuller statement of the accounts of the Dundee Corporation Gas Department shows that, of the total income of £83,722 during the past year, there was received for gas sold £76,011; from residuals, £5967; from coke, £260; and from gas-stove rental, £106. The cost of coal was £39,795; of purifying, £1179; of annuities, £7239; and of assessments, £4562. There was placed to sinking fund £7500; and to contingent fund, £1500. The quantity of gas made was 545,469,000 cubic feet; gas sold, 488,688,100 cubic feet; gas used at the works, 5,681,500 cubic feet; and gas unaccounted for, 51,099,400 cubic feet, or 9·367 per cent. The estimate for this year is for an output of 556 million cubic feet of gas.

At the last ordinary meeting of the Hamilton Town Council, Bailie M'Hale, the Convener of the Gas Committee, in moving the adoption of their report, said that the year's work had been very satisfactory. They had charged various items in the report against revenue which might have been charged against capital. This, they would admit, made a very material difference. They had also carried £1200 to the depreciation account. Proceeding, the Bailie said that the most satisfactory part of the report was the actual result of the extensions, which had been a saving in wages alone of £653. They had carbonized 800 tons of coal additional; while 9 million cubic feet of extra gas had been obtained from the arrangement. This, he considered, was very satisfactory indeed. The results of their extensions had been excellent; and he expected that in the current year they would be even better, because it was only a short time since they got anything like the full benefit of the extensions. As a matter of fact, they had not obtained the full benefit yet. Things were in a bit of chaos still; and until everything was got into ship-shape order, they could expect nothing else. Touching on the question of the coal-store, he said they had got the opinion of an expert, who had said it was advisable that they should proceed with this matter at once. The coal-store, he calculated, would be a saving in wages of £160, which sum was a very good return. The return otherwise would be a very great advantage. A good deal could be said as to having the advantage of a large stock of perfectly dry coal. Dry coal was essential; and no one required to be an expert to say what the result would be from having it. In conclusion, he asked the Council to endorse the Committee's recommendation, and grant their approval of the scheme for the erection of a coal-store, which would give them additional capacity for storing 500 tons of coal. There is always, in the Hamilton Town Council, a section of the members—happily a small one—who do not see eye to eye with those who specially have charge of the gas undertaking, and who are always ready to oppose any proposals for the improvement of the works. One of these moved that the erection of the coal-store should be delayed; and another, in support of this view, said there had been proposals every now and again about new ideas, and one got sick of requests for more money and more extensions. The cost of the coal-store, it was said, would be £750. The Town Council adopted the report of the Committee, and resolved to proceed with the erection of the coal-store. Those who object to extensions, seem to forget that if these are asked for they are necessary, on account of the condition in which gas-works were a few years ago, and also because of the great increase there has been in the consumption since the improvements which have already been executed enabled the Corporation to reduce the price of gas. The minority would have the gas undertaking to stand still. To follow such a course would be foolish. There was a gross profit on the year's working of £2348, after making more than ample allowance out of revenue for unredeemed capital for four purifiers and a meter sold, and for a bench of 34 retorts, which is about to be taken down. Had it not been for this method of dealing with the revenue, the gross profits would have been over £3000, which would have been the largest sum ever earned.

The annual meeting of the Stevenston (Ayrshire) Gaslight Company was held this week. A dividend of 5 per cent. was declared. It was resolved to proceed with the construction of a new gasholder and tank, and to lay new mains at a cost of about £1000.

The Kettle, Freuchie, Kettlebridge, and Ladybank Gas Company have paid a dividend of 5 per cent. for the past year, and have reduced the price of gas by 5d. per 1000 cubic feet—making it now 5s. 5d.

The Electric Lighting of the Central Meat Markets.—The Court of Common Council have granted an application made by the Solicitor of Messrs. Sax for permission to transfer the concession for lighting the Central Markets to Mr. J. Van den Berg and Sir John Morris.

Jubilee Holidays for Gas Workers.—The Derby Gas Company have decided to give all the men in their service on the 22nd inst. one day's holiday with full pay. The Gas Committee of the Leeds Corporation have come to a similar decision; and should the services of any of the men be required on that day, double pay will be allowed.

Free Drinking Water for Jubilee Day.—At the request of the Vestry of St. Martin's-in-the-Fields, the Chelsea Water Company have consented to put up stand-pipes at certain places on the line of route of the procession on Jubilee Day, to supply water free of charge to the public. Proper drinking-cups will be provided; and each stand-pipe will be in charge of one of the Company's men. The New River Company will also furnish a free supply of water for drinking purposes from stand-pipes in the portion of their district included in the route.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June 5.*

Sulphate of Ammonia.—There has again been a quiet market; the tendency of prices being rather in favour of buyers. Closing quotations are £7 8s. 9d. per ton Leith, £7 8s. 9d. to £7 10s. per ton Hull, and £7 12s. 6d. per ton f.o.b. Liverpool. There is a moderate export demand; but reduced production seems to be adequate to meet it. Buyers are more concerned about autumn delivery; and a fair business has been done in this position at about the level of spot prices.

Nitrate of Soda is dull, at 7s. 6d. per cwt. for fine quality on spot.

LONDON, *June 5.*

Tar Products.—Distillers are becoming very much disturbed about the prospects of pitch, forming as it does 50 per cent. of the tar. The present low price, compared with its value a year ago, seriously affects the position of tar. Having regard to the fact that the shipping season is practically over, it seems a suicidal policy for the makers to be pressing pitch upon the market as they are now doing. Benzols are firmer; and, in one instance, as much as 1s. 9d. has been paid for 90's. But this was exceptional, as the general value is 1d. to 1½d. less. A fair business is being done in creosote, which maintains its improved outlook. Solvent naphtha is also in good odour; and crude 30 per cent. naphtha is dearer. There is some inquiry for carbolic acid; but buyers are looking for lower prices. A little more life manifests itself in anthracene; a sale of special "A" quality during the week having realized a better price than quoted below.

To-day's values are: Tar, 15s. to 18s. 6d. Pitch, 21s. Benzols, 90's, 1s. 7½d.; 50's, 1s. 11d. Toluol, 2s. Solvent naphtha, 1s. 7d. Crude, 30 per cent., naphtha, 11d. Creosote, 1½d.; liquid, 2¼d. Heavy oils, 3½. Carbolic acid, 60's, 1s. 11d. to 2s. Pressed naphthalene, 62s. 6d. Creosote salts, 25s. Anthracene, "A," 7d.; "B," 5d.

Sulphate of Ammonia.—There are buyers at prices mentioned below; but sellers are hoping for better values. Shipments are fairly good; and prices during the present week have averaged about £7 10s., less 3½ per cent.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—One or two important gas coal contracts have been settled during the past week; and so far as prices for these can be ascertained, they are practically upon the same basis as last year. Inquiries in the market do not tend to show any further variation in general quotations, which remain at about 6s. 3d. per ton for common Wigan four-feet, and 6s. 9d. to 7s. 3d. for the better qualities of gas coal, such as Arley nuts, &c. In other descriptions, a steady tone is reported generally. The better qualities of round coal have been meeting with extra demand, in view of the usual Whitsuntide stoppages of the pits; and at most of the collieries about full time has been worked during the past week, while a check has been given to the accumulation of stocks.

Prices are steady at late rates; no reduction having been made in list quotations with the commencement of the month. At the pit mouth, best Wigan Arley coals remain at about 10s. per ton, with medium sorts 9s. 6d.; inferior Arley and Pemberton four-feet average 8s. to 8s. 6d.; and common house coals, 6s. 6d. to 7s. The position as regards common round coals remains practically unaltered; supplies being ample, with prices low. A fair demand, however, is reported for iron-making, steam, and general manufacturing requirements; and average quoted rates for inland sales are about 6s. to 6s. 6d. per ton, though slightly under these figures is taken in many cases for quantities. Engine fuel moves off readily, and supplies are none too plentiful; but any appreciable advance is extremely difficult to obtain, owing largely to some of the inferior sorts of slack being offered on the market at low figures, which tends to check any upward move in other descriptions. Best slack averages 4s. 6d. to 5s. per ton at the pit; medium sorts, 3s. 9d. to 4s. 3d.; and common descriptions, 3s. 3d. to 3s. 6d. Inquiry has been coming forward rather more freely in the shipping trade; but prices continue low—7s. 6d. to 7s. 9d. per ton remaining the average figures for ordinary steam coal delivered at the Garston Docks or the High Level, Liverpool.

Northern Coal Trade.—There has been an increased demand for coal during the last few days, as is usual before the holidays. Best Northumbrian steam coals are quoted 8s. 6d. per ton f.o.b.; second-class steam are about 8s.; and steam smalls, 3s. 6d. Manufacturing coals have little change in price; but the demand is temporarily reduced through the holidays. Gas coals are in increased request both for home use and for export. It is believed that there will be a much larger consumption of gas this summer than is usual at that season; the illuminations aiding in it. Hence stocks of coal may be enlarged. There is a good export of coal; and the tendency of prices where contracts do not rule is upwards. Good Durham gas coals command 7s. per ton f.o.b.; but some of the large producers of best kinds ask as high as 8s. per ton. One of the large contracts named last week has been settled at about the price then stated; and two others are to follow, which are likely to rule at quotations equal to from 6s. 9d. to 6s. 10½d. per ton f.o.b. Gas coke is rather firmer in price, the production being now at about its lowest point.

Scotch Coal Trade.—All classes of coal, except splint, continue to be in good demand. There is some excitement among owners over the contracts for the Glasgow Corporation Gas Department, the Clyde Navigation Trust, and the Clyde Lighthouse Trust, which are now in the market. It is expected that prices will be from 3d. to 6d. per ton higher than last year. The rates quoted are: Main, 6s. 3d. per ton f.o.b. Glasgow; ell, 6s. 9d. to 7s. 3d.; and splint, 6s. 6d. to 6s. 9d. The shipping trade is exceptionally busy. The shipments for the week amounted to 171,394 tons—an increase upon the preceding week of 15,267 tons, and upon the corresponding week of last year of 18,615 tons. For the year to date, the total shipments have been 2,968,771 tons—an increase over the same period of last year of 126,095 tons.

The Filey District Council and the Gas and Water Works.—The Filey District Council have instructed their Clerk to write to the local Gas and Water Company, asking if they will agree to sell their concern to the town, and at what price.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 1292).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	9 Apl.	10½	Alliance & Dublin 10 p. c.	23–25	..	4 4 0
100,000	10	,,	7½	Do. 7 p. c.	17½–18½	..	4 1 1
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	108–111	..	4 10 11
200,000	10	27 May	7	Belgrano (B. Ayres), Limited	9½–10*	..	7 0 0
100,000	Stck.	30 Dec.	5	Do. 5 p. c. Deb. Stk	104–107	..	4 13 5
200,000	5	27 May	6½	Bombay, Limited	6½–7*	..	4 5 9
40,000	5	,,	6½	Do. New, £4 paid	5½–5¾*	..	4 10 7
380,000	Stck.	26 Feb.	12	Brentford Consolidated	297–302	..	3 19 7
240,000	,,	,,	9	Do. New	223–228	..	3 18 7
50,000	,,	,,	5	Do. 5 p. c. Pref.	115–150	..	3 6 8
159,375	,,	11 Dec.	4	Do. 4 p. c. Deb. Stock.	130–134	..	2 19 9
220,000	Stck.	25 Mar.	11½	Brighton & Hove Original	273–278	..	4 2 8
208,820	,,	,,	8½	Do. A Ord. Stk.	197–202	..	4 4 2
933,500	Stck.	26 Feb.	5	Bristol, 5 p.c. max.	130–135	..	3 14 1
420,000	20	26 Mar.	11½	British	56–57	..	3 18 11
50,000	10	26 Feb.	11½	Bromley, Ordinary 10 p. c.	23–25	..	4 12 0
71,000	10	,,	8½	Do. 7 p. c.	18–20	..	4 5 0
300,000	10	28 Apl.	6	Buenos Ayres (New) Limited	9¾–10¼	..	5 17 1
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	101–103	..	5 16 6
150,000	20	26 Feb.	8½	Cagliari, Limited	30–32	..	5 3 1
100,000	10	30 Sept.	8½	Cape Town & District, Ltd.	17–18	..	4 8 11
50,000	50	3 May	6	Do. 6 p. c. 1st Mort.	57–59	..	5 1 8
550,000	Stck.	9 Apl.	13½	Commercial Old Stock	342–347‡	+2	3 17 9
165,000	,,	,,	10½	Do. New do.	257–262‡	+2	4 0 1
165,000	,,	11 Dec.	4½	Do. 4½ p. c. Deb. do.	150–155	..	2 18 0
800,000	Stck.	30 Dec.	13	Continental Union, Limited.	255–260	..	5 0 0
200,000	,,	,,	10	Do. 7 p. c. Pref.	215–220	..	4 10 11
51,600	Stck.	26 Feb.	14	Croydon Com'cial A 10 p. c.	317–322	..	4 6 11
163,400	,,	,,	11	Do. B 7 p. c.	255–260	..	4 4 7
535,000	Stck.	26 Feb.	5¼	Crystal Palace Ord. 5 p. c. Stk	139–142	..	3 13 11
60,000	,,	,,	5	Do. 5 p. c. Pref.	140–143	..	3 9 11
486,090	10	29 Jan.	11	European, Limited	24½–25½	..	4 6 3
351,060	10	,,	11	Do. £7 10s. paid	17½–18½	..	4 9 3
5,896,590	Stck.	12 Feb.	12¾	Gaslight & Coke, A, Ordinary	312–317	..	4 0 5
100,000	,,	,,	4	Do. B, 4 p. c. max.	112–117	..	3 8 5
665,000	,,	,,	10	Do. C, D, & E, 10 p. c. Pf.	312–317	..	3 3 1
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	150–155	..	3 4 6
63,000	,,	,,	7½	Do. G, 7½ p. c. do.	220–225	..	3 6 8
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	207–212	..	3 6 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	312–317	..	3 3 1
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	182–187	..	3 4 2
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	140–143	..	2 15 11
294,850	,,	,,	4½	Do. 4½ p. c. do.	152–157	..	2 17 4
908,000	,,	,,	6	Do. 6 p. c. do.	207–212	..	2 16 7
70,000	10	13 May	6	Hongkong & China, Limited	13–14	..	4 5 10
					‡ Ex new.		
3,800,000	Stck.	13 May	10	Imperial Continental	212–217	..	4 12 2
376,400	100	1 Feb.	4	Do. 4 p. c. Debs. Red.	100–103	..	3 17 8
473,600	Stck.	12 Feb.	3½	Do. 3½ p. c. Deb. Stk ,,	104–107	..	3 5 5
75,000	5	11 Dec.	6	Malta & Mediterranean, Ltd.	5¾–6¼	..	4 16 2
560,000	100	1 Apl.	5	Met. of Melbourne, 5p. c. Deb.	112–114	+1	4 7 8
250,000	100	,,	4½	Do. 4½ p. c. Debs.	107–109	..	4 2 7
541,920	20	12 Nov.	5	Monte Video, Limited	14½–15½	..	6 9 0
150,000	5	27 May	8	Oriental, Limited	8¼–8¾*	..	4 11 5
135,000	5	,,	8	Do. New, £4 10s. paid	7¾–7¾*	..	4 12 10
15,000	5	,,	8	Do. do. 1879, £1 paid	1¾–2*	..	4 0 0
60,000	5	26 Mar.	7	Ottoman, Limited	5–5¼	..	6 7 3
420,000	100	3 May	6	People's Gas } 1st Mtg. Bds.	104–109	..	5 10 1
500,000	100	1 June	6	of Chicago } 2nd Do.	105–110*	+1	5 9 1
250,000	10	27 May	10	San Paulo, Limited	14–15*	..	6 13 4
5,475,000	Stck.	26 Feb.	5½	South Metrop., 4 p.c. Ord.	141–144	..	3 12 11
1,416,667	,,	—	3	Do. 3 p.c. Deb. Stk.	107–110	+1½	2 14 7
60,000	Stck.	12 Mar.	11½	Tottenham & Edmonton, A	275–285	..	4 0 10
60,000	,,	,,	8½	Do. B	190–200	..	4 5 0
182,380	10	27 May	10	Tuscan, Limited	13½–14½*	..	6 18 0
149,900	10	2 Jan.	5	Do. 5 p. c. Debs. Red.	102–105	+1½	4 15 3
				WATER COMPANIES.			
746,159	Stck.	30 Dec.	10½	Chelsea, Ordinary	330–335	..	3 2 8
150,000	,,	,,	5	Do. 5 p. c. Pref.	175–180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	158–162	..	2 15 6
175,785	,,	26 Mar.	4½	Do. 4½ p. c. Deb. Stock	160–165	..	2 14 6
1,720,560	Stck.	9 Apl.	7	East London, Ordinary	221–225	..	3 2 9
654,740	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	164–169	..	2 13 4
390,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	107–109	..	2 15 0
700,000	10	11 Dec.	7½	Grand Junction, 10 p.c. max.	119–124	+1	3 0 6
295,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	148–153	..	2 12 4
708,000	Stck.	12 Feb.	12	Kent	342–347	..	3 9 2
160,000	,,	,,	7	Do. New, 7 p. c. max.	212–217	..	3 4 6
1,043,800	100	30 Dec.	9¾†	Lambeth, 10 p. c. max.	283–288	+1	3 7 8
406,200	100	,,	7½	Do. 7½ p. c. max.	220–225	..	3 6 8
350,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	147–150	..	2 13 4
500,000	100	12 Feb.	13	New River, New Shares.	423–428	..	3 0 8
1,000,000	Stck.	29 Jan.	4	Do. 4 p. c. Deb. Stk.	152–155	..	2 11 7
902,300	Stck.	30 Dec.	6	S'thwk & V'xhall, Ordinary	158–163	+1	3 13 8
126,500	100	,,	6	Do. Do. 7½ p. c. Max.	150–155	..	3 17 5
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	175–180	..	2 15 7
1,019,585	,,	9 Apl.	4	Do. 4 p. c. A Deb. Stk.	145–148	..	2 14 2
1,155,066	Stck.	11 Dec.	13	West Middlesex	313–318	+3	3 2 10
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	163–168	..	2 13 7

† Next dividend will be at this rate. *Ex div.

New Water-Works for Croydon.—The Croydon Corporation are about to apply to the Local Government Board for sanction to borrow £32,000 for the construction of new water-works at Waddon, where boring operations have been carried on with great success. The average daily consumption of water in Croydon is nearly 3 million gallons.

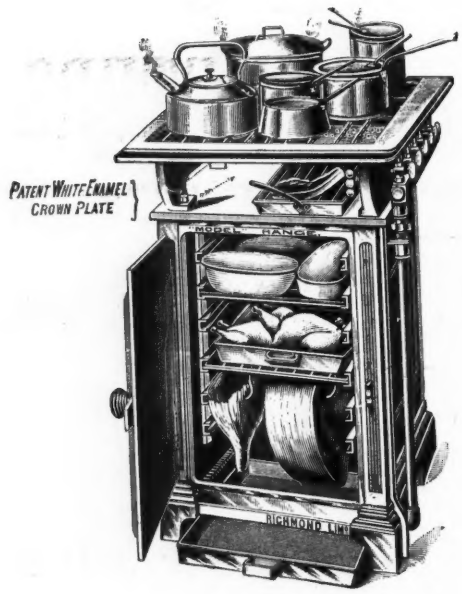
The Welsh Water-Works of the Birmingham Corporation.—A few days since, about fifty members of the Birmingham City Council paid a visit of inspection to the new water-works in the Elan Valley and the course of the projected line of mains to the city. One day was occupied in an examination of the conduits and tunnels which are being driven between Knighton and Dolan. Leaving Llandrindod Wells early the next morning, the party, under the guidance of Alderman Parker, Chairman of the Water Committee, and Alderman Clayton, visited first the Caban Coch dam, where the Lord Mayor laid a memorial stone, and subsequently the Pen-y-gareg and Craig Goch reservoir works and the site and completed portion of the submerged Craig Ddu dam at Pen-y-gareg. During the trip, the visitors were informed that the extent of the area over which the Corporation have acquired control is some 45,000 acres, or 71 square miles. Of this, 35,000 acres have been actually bought; and, as regarded the other 10,000 acres, the manorial rights have been purchased, in order to prevent pollution by lead mining. The expenditure on the scheme up to the present time has been a million sterling; while contracts have been given out for works estimated at another half million. The estimates so far have proved trustworthy.

The Local Government Board and Gratuities to Officials.—Attention is called by the "Local Government Journal" to the fact that Urban and Rural District Councils not uncommonly testify their appreciation of the zeal of an official by awarding him a gratuity out of the rates; and it is considered not unreasonable that extra services or specially meritorious work should be recognized in this way. As the law stands, however, gratuities, as such, are illegal, as will appear from the following letter, which has been addressed by the Secretary to the Local Government Board to the Clerk of a Kent Rural District Council: "Adverting to the fact that you are paid a fixed annual salary, I am to point out that section 190 of the Public Health Act, 1875, which governs your remuneration as Clerk to the Council, does not admit of a gratuity being paid to you in that capacity. With the view, however, of meeting the difficulty which has been found to arise from the absence of such a provision, the Board have in some cases approved of the increase of a Clerk's salary for a future limited period on account of extra services. The Board would therefore suggest that the Council should pass a resolution increasing your salary for a specified period on account of the services referred to. With regard to the proposed gratuity to the Surveyor, I am to state that the Board's sanction to the payment of the remuneration of a Surveyor is not required. The Board, however, deem it right to draw the attention of the Council to the case of *ex parte Mellish* (8 L. T., new series, 47), in which it was decided that there is no power to give gratuities out of the rates."

Water-Works Extension at Bacup.—The Bacup Corporation have decided to spend a sum of upwards of £116,000 on a new water scheme. It is proposed to purchase for £36,000 water rights and gathering area in the Cowpe Valley, construct two reservoirs at a cost of £55,000, and expend £25,000 on new mains. One of the reservoirs will be on such a level as to supply the highest parts of the borough, and have a holding capacity of 5 million gallons. The other will be a main reservoir to hold 150 million gallons.

Sowerby Bridge Gas-Works Accounts.—The report of the Gas Committee of the Sowerby Bridge District Council for the past year shows that the expenditure amounted to £13,721, and the income to £15,851; leaving a credit balance of £2130. The sum of £62,000 has been borrowed on gas-works account, and £43,000 has been repaid. Ten years ago there were 3500 consumers; and now there are 5400, including Luddendenfoot and Luddenden, which have been recently added to the area of supply. Ten years ago 65 million cubic feet of gas were sold; and last year the consumption reached 100 millions, which is an increase of 5 millions over the previous year. The result of the year's working was regarded as satisfactory, considering that the price of gas had been reduced from 2s. 6d. to 2s. 3d. per 1000 cubic feet, with the usual 10 per cent. discount.

Teignmouth Gas and Water Works.—On Tuesday, May 25, Major-General H. D. Crozier, R.E., held an inquiry at Teignmouth respecting an application by the Urban District Council for power to borrow, among other sums, £7500 for gas-works purposes and a similar sum for works of water supply. Mr. J. H. Portbury, the Gas Manager, explained the proposals with regard to the gas-works, which are in accordance with the suggestions recently made by Mr. F. Livesey, who was called in by the Council to advise them as to the means to be adopted to bring the works up to modern requirements. The scheme includes a new 14-inch main in place of the present 8-inch pipe from the works to the town, and larger mains in some other parts of the area of supply; and the erection of new retorts, a new holder, scrubber and washer, purifiers, and sulphate of ammonia plant. It was estimated that the additions would increase the productive capacity of the works by from 35 to 50 per cent. The scheme for extending the water supply was laid before the Inspector by Mr. C. Jones, the Surveyor. There are two reservoirs for supplying Teignmouth; but the larger of these, at Hazeldown, which has a capacity of 2 million gallons, is out of repair, and will not hold water. It is proposed to re-floor and re-wall both this reservoir and the smaller one at Landscove, and cover them; to lay new mains in order that the water may be pumped direct into the Hazeldown reservoir; and to make additional provision for the storage of water in winter for use in the summer. Deacon waste-water meters are also to be provided. The effect of the improvements will be, it was suggested, to enable a constant supply of water to be maintained to the inhabitants of the district all the year round. There was no opposition by the ratepayers to either of the schemes.



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Beccles Gas Company.—The annual meeting of the Beccles Gas Company took place last Wednesday, when it was resolved to pay a dividend of 6¼ per cent. on the original, and 5¼ per cent. on the new shares, in addition to the interim dividend of 2½ per cent. paid on all shares in December. The profits for the year amounted to £1148.

Proposed Purchase of the Felixstowe and Walton Water-Works by the Local Authority.—The Felixstowe Urban District Council last Wednesday evening had a long discussion in respect of the proposal to purchase the undertaking of the Felixstowe and Walton Water Company, under the terms of the Company's Act; the time-limit inserted in this connection being about to expire. The Finance Committee recommended the Council to promote a Bill, and, failing agreement with the Company as to the price to be paid for their undertaking, to go to arbitration. Mr. Downes, in moving the adoption of the recommendations, said that according to the balance-sheets of the Company, their profits in 1895 amounted to £675, and for 1896 to £1099. At twenty years' purchase, this would give a return of 5 per cent. on the outlay; whereas the amount required could be borrowed for a term of fifty years at about 3 per cent. Twenty years' purchase, based on the average annual profit for the two years, would amount to £17,750; and assuming that the profits from the undertaking did not increase, there would be a net profit of £300 a year. The motion was adopted.

The Accumulated Profits of the Leeds Corporation Water Department and the Rates.—At a special meeting last Wednesday, the Leeds City Council indulged in some discussion on the resolution of the Water Committee to grant £18,000 out of their funds in aid of the rates. On the minutes of the Committee being introduced for confirmation, Mr. Henry moved as an amendment that they be adopted excepting that relating to the transference of the £18,000. He argued that, by adopting the suggested plan, they tempted the different Committees into extravagance, and that the Water Committee ought to accumulate a substantial reserve fund to provide against contingencies. Mr. Ford seconded the amendment, observing that Alderman Gordon had suggested that £100,000 had been thrown away on the Eccup reservoir through what he called Radical blundering. If this was so, the best way was to make up this amount out of revenue, and not take the water-works profits until the reserve of £90,000, suggested by the Act of Parliament, had been created. Mr. Willey thought the amendment very inopportune. The Council only a month since had decided on the principle that it was good policy to take the profits of a Corporation manufacturing undertaking to relieve the rates; and to rake up the subject again was a waste of time. He believed the majority of the ratepayers were in favour of this policy. Mr. Wilson remarked that Mr. Henry regarded this as a fitting opportunity to make political capital out of the question. The Council had not decided that there should be a reserve fund of £90,000 on the water-works. Alderman Scarr opposed the proposal on the ground that "every tub should stand on its own bottom." Alderman Gordon (Chairman of the Finance Committee) argued that the proposal was good finance. The amendment was defeated; and the minutes adopted by 30 votes to 19.

Colwyn Bay and Conway Water Board.—An award has been issued in an arbitration between the Colwyd Water Board and others in regard to a question as to the payment for new mains. It may be remembered that the Colwyn Bay members of the Board succeeded in carrying a resolution for the laying down of new mains through their district to Llysfaen at the cost of the Joint Board (see *ante*, p. 247). The Conway members of the Board objected to this; holding that Colwyn Bay should bear the cost of new mains in their district. The matter was submitted to arbitration, with the result that the Joint Board are ordered to bear the cost of the mains from Sarn Mynach to Tygwyn, the Colwyn Bay District Council to pay for the pipes within their district, and the Conway Rural Sanitary Authority to be responsible for the pipes running through Llysfaen.

Grand Junction Water-Works Company.—The accounts of this Company for the half year ending March 31, which will be presented at the meeting of shareholders to-morrow, contain an entry of £6795 for special expenditure in connection with the lowering of mains, parliamentary matters, and assessment appeals; and in their report the Directors explain that the total is exceptionally large on account of the very heavy costs (£2534) incurred in the appeals against the recent quinquennial valuations. The total revenue in the six months was £106,714; the expenditure, £49,615, of which £11,764 was for rates and taxes. A sum of £51,599 is placed to the dividend and interest account, and £5500 is carried forward. The balance applicable for division is £46,592, as compared with £44,842 this time last year; and the Directors recommend a dividend at the rate of 7½ per cent. per annum on the ordinary and £25 "C" shares, and of 7 per cent. per annum on the £50 "D" shares.

Matlock Bath Gas-Works Purchase.—A meeting of the Matlock Bath Gas Company was held yesterday week for the purpose of authorizing certain payments in connection with the purchase of the Gas Company's undertaking, and as to the award of Sir William Coddington, who acted as Arbitrator between the parties. There was also the question of obtaining the loans and the interest to be paid. A lengthy explanation was offered by the Chairman (Mr. T. E. Lawton), who said the total amount of the expenses in connection with obtaining the Act of Parliament had not been ascertained at present; but he might say the amount fixed by Sir William Coddington for the purchase of the property was £16,726; and there had been a second award for stock which came to £807. In addition to these, £250 was allowed for the winding up of the Company. The costs of fixing the purchase-money amounted to £1308. There was the stamp for the first award £83 15s.; and for the second, £4 5s. The capital expenditure on mains and works amounted to £800; and the stamps and charges for obtaining the loan came to £236 5s. These made a total of £20,236 9s. 10d. In reply to questions, the Chairman added that he did not anticipate much profit on the gas-works for a few years; but after about five years, there would be a good income to go to the rates. As to the removal of the works, it was optional, and not compulsory, as some people had imagined. They had land which they could take in three years; but it might be found they had even more eligible ground than that which was granted to them in the Act.

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Fatality at a Hull Gas-Works.—Last Thursday week, William Holmes (age 36), in the employ of Mr. Daniel Howard, of West Bromwich, was at work riveting plates on a holder under construction for the Sutton, Southcoates, and Drypool Gas Company, when he slipped, and fell to the bottom of the holder—a distance of about 32 feet. He was taken out by some of his fellow-workmen; but, on the arrival of a doctor, life was found to be extinct. At the inquest on the body, Arthur James stated that he was working with Holmes on two 11-inch planks held up by hanging irons. The deceased was reaching for his hammer when he fell on top of the plank, and that went with him. Mr. Richards, the foreman, described the erection of the scaffolding, and said, if the men wished, they could "dog" the planks. A verdict of "Accidental death" was returned; the jury advising that dogs be used in future, which Mr. Richards said he would see was done.

West Bromwich Corporation Gas Supply.—At the meeting of the West Bromwich Town Council last Wednesday, the Gas Committee presented the accounts of the gas undertaking for the year ending March 31, as noticed in the "JOURNAL" last week (p. 1252). They recommended that £1500 should be applied in aid of the district rate for the current year, £1300 be transferred to the depreciation fund account, and £34 18s. 1d. added to the balance of undivided profits, making an aggregate of £10,931, which was employed as working capital. They also recommended that the salary of the Manager (Mr. T. Glover) be increased by £60 per annum. Alderman Farley, in moving the adoption of the report, said he had no hesitation in asserting that if the undertaking belonged to a private company the price of gas in the borough would be much higher; so that, owing to its being the property of the Corporation, the ratepayers derived a great advantage. He hoped the time would come when, instead of handing over £1500 towards the relief of the rates, they would allocate £3000. With regard to the salary of the Manager, Mr. Glover had proved himself worthy of such a consideration as the proposed increase. The report was adopted.

The Local Government Board and the Chippenham Water Scheme.—The Chippenham Town Council have received a letter from the Local Government Board in respect to the report made by one of their Inspectors as to the proposal of the Council to borrow £6300 for works of water supply. The Board are advised that the works as designed are open to objections in some respects, and that the following amendments should be made: (1) The walls of the reservoir should be built entirely of bricks in cement, instead of the combination of concrete and brickwork shown on the section, and should not be less than three bricks in thickness. (2) The floor of the reservoir should be constructed in two courses of brickwork laid flat in cement. (3) The inner face of the reservoir walls and the upper course of brick floor should be composed of blue brick. (4) The floor, base of columns, and walls should rest on a foundation of portland cement concrete, which should be 6 inches thick under the floor, and 12 inches thick under the footings of the walls and bases of the columns; and, if necessary, clay puddle should be provided under the concrete foundation. (5) The supply of water should be drawn from the top of the reservoir by means of a floating arm. The Board, on the reception of amended plans, will consider the application as to the borrowing of the money necessary to carry them out.

Guildford Corporation and the Gas Company.—The Guildford Town Council are dissatisfied with the light afforded by the gas supplied by the Guildford Gas Company; and so they have adopted the old dodge of menacing the Company with the electric light. According to a report submitted to the last meeting of the Council, the Lighting Committee have been considering a proposal to light certain parts of the town by electricity. They are of opinion that, unless considerable improvement in the quality of the gas now supplied is shortly effected, it will be necessary not only to consider the propriety of introducing the electric light into parts of the district, but also whether the existing agreement with the Company shall not be terminated altogether. This being so, the Committee recommended the Council (who agreed) to defer the matter for a short period, to see if any steps were taken by the Company to bring about the desired improvement. Reading between the lines, one can only conclude that the Lighting Committee's investigations into electric lighting have revealed to them the fact that it is a somewhat more expensive illuminating medium for the streets; or why such forbearance with the Gas Company? It may be suggested, too, that perhaps it is the quality of the street-lamp fittings, and not of the gas, that is at fault; but probably some light will shortly be thrown on this, as the Council have appointed Dr. S. Rideal to make periodical examinations of the gas.

Messrs. R. & A. Main and Messrs. Fletcher, Russell, and Co., Limited, held exhibitions of their appliances in Edinburgh last week.

At the meeting of the Lamp Manufacturing Company, Limited, on the 31st ult., a dividend of 7 per cent. per annum on the preference shares was declared.

Mr. F. Nell, of Queen Victoria Street, E.C., has secured an order for the supply of two 33-inch "Victor" turbines for the Guildford Corporation Water-Works; the contract price being £940.

Messrs. D. M'Donald and Sons, of Hawick, are the successful tenderers for the construction of a new system of water-works for the Lerwick Burgh Commissioners, at a cost of between £4000 and £5000.

Messrs. C. Wilson and Son, of Leeds, were the principal exhibitors at a show of gas stoves and appliances held at Cleckheaton last week. The accompanying cookery demonstrations were conducted by Miss Grace Holroyd.

Mr. Alfred Richards will offer for sale by auction at the Mart on the 5th prox., by order of the Directors of the Tottenham and Edmonton Gas Company, £15,000 of 4 per cent. debenture stock, under the provisions of the Company's Act of 1882.

In connection with the Gas Department of the Tipton District Council, and in conjunction with Messrs. J. Wright and Co., Messrs. W. Parkinson and Co. held a Gas Exhibition at Tipton from Monday to Friday last. Miss A. C. Wilkinson gave demonstrations on cookery twice daily.

CARBURETED WATER-GAS APPARATUS

MERRIFIELD—WESTCOTT—PEARSON PATENTS.

THE

ECONOMICAL GAS APPARATUS CONSTRUCTION Co., Ld.

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The Complete Plant for the

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WILL HAVE A

GUARANTEED DAILY CAPACITY OF 8 MILLION CUBIC FEET,

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MAXIMUM CAPACITY OF 10 MILLION CUBIC FEET.

An Illustrated Advertisement of the Plant will appear next week.

GWYNNE & BEALE'S

PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

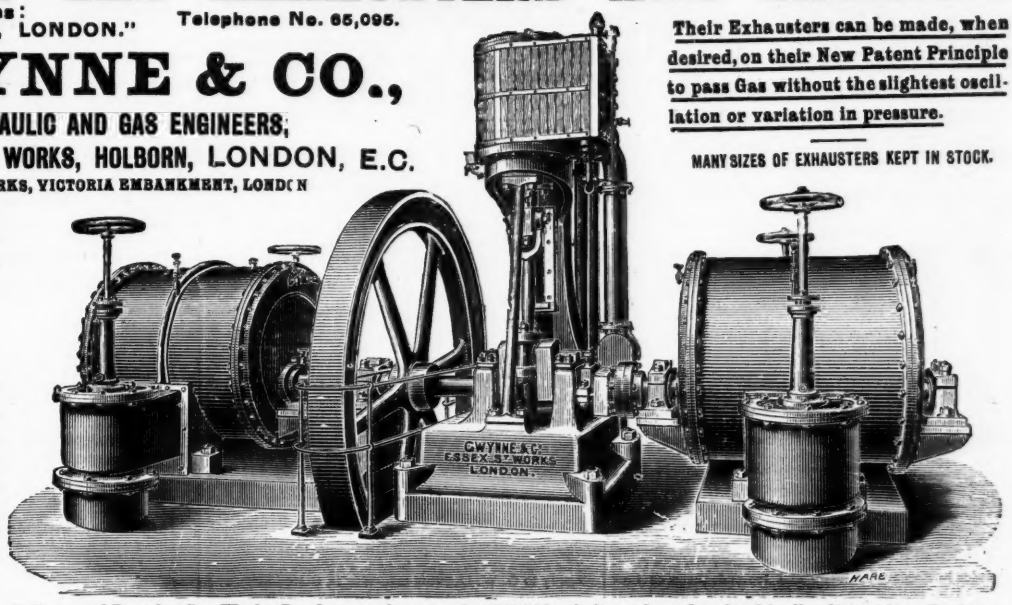
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES HYDRAULIC REGULATORS VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.

ANDREW STEPHENSON, 182, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.

Telegrams: "Volcanism, London."

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BROTHERTON AND Co., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR wanted.

BROTHERTON AND Co., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE wanted.

BROTHERTON AND Co., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID for Sale.

BROTHERTON AND Co., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application.

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HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.

Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.

READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

[For Illustrated Advertisement, see June 1, p. 1271.]

SADLER & Co., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c.

Correspondence invited.

Telegraphic Address: "Sadler, Middlesbrough."

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS. MANCHESTER.

Telegrams: "ENAMEL." National Telephone 1759.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.

Please write for Estimate before ordering elsewhere.

ALEX. P. KER, C.E., Consulting Gas Engineer, Hunton Road, Grave'ly Hill, Birmingham, 25 Years Assistant Engineer and Manager of Works to the Corporation of Birmingham and their predecessors, MAY BE CONSULTED on all matters connected with GAS ENGINEERING, including Valuations, Alterations, Additions and Extensions, &c. REPORTS upon EXISTING WORKS and IN PROGRESS. EXAMINATIONS OF GAS for ILLUMINATING POWER and IMPURITIES conducted. Plans, Specifications, and Estimates prepared.

ECONOMY IN PURIFICATION.

INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.

References and Particulars can be obtained from the Makers—

C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP.

And J. EVERY & SON, Phœnix Iron-Works, LEWES.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

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Telegrams: "BOGORE, LONDON."

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JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.

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BLUE PRINTS of all kinds in any weather. Drawings and Tracings promptly executed.

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JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

TO GAS AND WATER OFFICIALS.

SPECIAL and Favourable Terms for CYCLES are offered. The very best "up-to-da" Cycle at a reasonable Cost. "Dunlop" Tyres, Weldless Tube throughout, "Westwood" Rims, "Brook's" Saddle, "Perry's" or "Renold's" Chain, &c. The whole combining to make as fine a Machine as is possible to be made. Satisfaction guaranteed. Send at once for Catalogue post free.

MELROSE CYCLE COMPANY, COVENTRY.

SON of Manager (age 30) seeks a Situation as GAS-FITTER. Well up in Iron and Compo. work, fixing Meters, Cookers, and Fires, Main and Service laying, Incandescent Street Lighting, and the general routine of a Gas-Works. Good References if required.

Address No. 2850, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER (Son of a Gas Manager) desires a Situation as SECRETARY and MANAGER or MANAGER of Gas or Water Works. Experienced in both. Holds Certificates for Chemistry and Honours Grade Gas Manufacture. First-Class Testimonials and References.

For further Particulars, apply to No. 2857, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by an energetic and competent GAS-FITTER, a Situation in that capacity. Fourteen Years' thorough experience in Main and Service laying, Iron and Compo., Meter Fixing and Inspecting, Cookers, Fires, and general routine of a Gas-Works. First-class References. Moderate wages if permanent.

Address No. 2862, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Retort Setters.
Apply to R. DEMPSTER AND SONS, LIMITED, ELLAND.

CLERK OF WORKS.

WANTED, at once, a Clerk of Works, experienced in Gas Plant and Building Work. Salary 3½ guineas a week.
Apply to Mr. PERCY GRIFFITH, Assoc.M.Inst.C.E., 55, Parliament Street, WESTMINSTER, S.W.

TO GAS-FITTERS.

WANTED, at once, a Gas-Fitter capable of laying Mains and Service-Pipes and Inspecting Meters.
Apply, stating Age and Wages required, and enclosing *copies* of Testimonials (which will not be returned), to T. LAYTON, Manager, Gas-Works, REDDITCH.

WORKING Manager wanted for small Gas-Works within 32 miles of London; make 8½ million feet annually. Man to assist. Must take Meters. Only steady man need apply. State whether Mechanic, Age, Experience, and References. House, Garden, Firing, and 25s. weekly Wage.
Apply, by letter, to No. 2860, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A GAS-WORKS in North Staffordshire require a FOREMAN, who has had experience in the working of Engine and Exhausters and Steam-Pumps, and who is able to do Main and Service laying and repair Stokers' Tools, &c. Must be of good Character, Sober, and Industrious. Wages to commence at 30s. per week.
Address No. 2863, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a well-known Firm having Representatives calling upon Gas Companies in England, Wales, and Ireland, three or four more REPRESENTATIVES for Districts where not at present represented.
Reply to No. 2861, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C., stating full Particulars as to Salary and Districts best acquainted with. Only those with good connection need apply.

SOUTHBANK AND NORMANBY GASLIGHT AND COKE COMPANY, LIMITED.

WANTED, a Competent Man as Fitter, METER INSPECTOR, and REPAIRER, to do Smithing and general Repairs of Works, and to make himself generally useful. Must have a good character for Sobriety and Competency. To a suitable Man, the appointment would be a permanency, and liberal wages given.
Apply, with two recent Testimonials, stating Wages required, to WILLIAM NIXON, Secretary and Manager, Gas-Works, Southbank, R.S.O., YORKS.

GAS MANAGER.

WANTED, by the Directors of the Stirling Gaslight Company, a MANAGER, who must have experience of the most approved Methods of Manufacturing Gas, and be competent to erect suitable Plant, &c.
Duties to be entered upon not later than the 1st of July next.
Salary, commencing at £200 per annum, with free House, Coal, Gas, and Taxes.
Applications with Testimonials, to be lodged on or before June 12, 1897, with E. Gentleman, Secretary, 59, Murray Place, Stirling.
No personal canvass permitted.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

WANTED, Two or Four Second-hand PURIFIERS, 12 feet square.
Write, with Particulars and Price, to No. 2856, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating Price per ton and quantity, No. 2772, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, the following Second-hand GAS PLANT. Must be in good Condition.
Three PURIFIERS, 8 ft. by 6 ft., with Centre-Valve and 6-inch Connections.
One 6-inch PIPE CONDENSER, with Valves complete.
One STATION METER, to pass 5000 cubic feet per hour, with 6-inch Connections and Valves.
Offers to No. 2858, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

OIL Coke for Sale. Made from Retorted Shale Oil, Suitable for Steel Manufacturers, &c.
Apply to the MANAGER, Gas-Works, HUYTON.

STORAGE Tanks for Tar and Liquor Several Wrought and Cast Iron ones up to 275,000 gallons capacity FOR DISPOSAL, cheap.
J. FIRTH BLAKELEY, Gas Engineers, Ravensthorpe, YORKS.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also COMPLETE WORKS equal to 7000, 20,000, 60,000 cubic feet per diem. **Inquire and compare Prices and Particulars before ordering elsewhere.**
J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

FOR SALE—A Round Station Meter (by Milne), 7-inch Connections and Bye-Pass Valve; 7000 cubic feet per hour. In good order. Being replaced by a larger one.
Apply to the Gas-Works, MUSSELBURGH.

FOR SALE—A Station Meter complete, in thorough working order. Recently overhauled and certified correct by Messrs. Braddock. Capacity, 50,000 feet per hour.
Apply to JOHN H. DARBY, Brymbo, near WREXHAM.

FOR SALE, cheap—
One TELESCOPIC GASHOLDER, 32 ft. diameter, with two lifts 14 ft. deep each; Capacity, 23,500 cubic feet, with Wrought-Iron Tank complete.
One CAST-IRON SCRUBBER, 38 ft. 6 in. by 6 ft. diameter.
Two PURIFIERS, 8 feet square, complete, with 6-inch Bye-Pass Valves and Connections.
EXHAUSTERS, 5000 to 60,000 cubic feet per hour.
We would undertake to re-erect any of the above, if desired.
Photos, Particulars, and Prices of above on application to SAML. WHILE AND SONS, 60, Queen Victoria Street, LONDON, E.C.

GAS PLANT for Sale—
TOWER SCRUBBER, 30 feet high and 5 feet diameter, with 10-inch Connections and Four-Way Valve. Filled with Boards.
STATION METER for 8000 Cubic Feet per hour, with 10-inch Bye-Pass and Connections.
Eighteen RETORT MOUTHPIECES, 21 in. by 15 in. O. 6-inch Outlets, complete with Bridles, Lugs, and Lids.
ASCENSION-PIPES, 6 inch to 5 inch taper, and 5-inch H-PIPES.
WROUGHT-IRON, HYDRAULIC MAIN, with Six Dip-Pipes and Valve, and one spare 6-inch square Bridge Valve.
The above are in first-rate condition.
Apply to G. W. LUPTON, Gas-Works, Otley, YORKS.

COMPLETE GAS PLANT FOR SALE.

TO BE SOLD separately, or in one lot—
Two Double-Lift HOLDERS, 34 ft. 4 in. diameter outer, 32 ft. 10 in. inner, 14 ft. 3 in. deep, with Pipes, &c.
One GOVERNOR, SYPHON-BOXES, VALVES, &c.
One STATION METER, with Valves (new), Braddock's make.
One Set of four PURIFIERS, 7 ft. square by 4 ft. deep, Walker's make, with Grids and one of their Centre-Valves, Connections, and Lifting Gear.
One TAR-PUMP and STORE BOILER.
One "ECLIPSE" WASHER-SCRUBBER, Laycock and Clapham, with Pulleys and Governor, erected in 1890.
One EXHAUSTER, with 12-inch Valves and Connections.
One Horizontal CONDENSER, with fourteen 8-inch Pipes, 18 ft. long, with Bye-Pass, Valves, and Connections.
Twenty RETORT MOUTHPIECES, with Lids and Duplicates, Dip, Ascension, and Bridge Pipes, Hydraulic Main and Valve, Fire-Doors, Buckstaves, and Tie-Rods.
12-inch and 8-inch MAINS, at per ton.
12-inch VALVES, at each.
For further Particulars and Prices, apply to H. I. WILLIAMS AND CO., Kidsgrove, STOKE-ON-TRENT.

FENTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply and delivery of 3000 to 5000 Tons of good GAS COAL or BURGY.
Forms of Tender and Particulars may be obtained from the Manager.
Tenders to be sent in on or before Saturday, the 19th inst., marked "Tender for Coal," and addressed to the Chairman, Gas-Works, Fenton.

F. H. DARWIN,
Manager.

Gas Offices, Fenton,
June 3, 1897.

SMETHWICK GAS-WORKS.

TENDERS FOR GAS COAL AND LIME.

THE Gas Committee of the Urban District Council of Smethwick invite TENDERS for the supply of about 25,000 Tons of GAS COAL for delivery over the Year ending the 30th of June, 1898.
Forms of Tender may be obtained from the undersigned.
Tenders are also invited for the supply of about 300 Tons of Purifying LIME during the same period.
Sealed tenders, endorsed "Tender for Gas Coal," or "Lime," (as the case may be), and accompanied, if possible, by an Analysis, to be addressed to the Chairman of the Gas Committee, and delivered to the undersigned on or before June 15, 1897.

By order,
W. J. STURGES,
Secretary.

Public Buildings, Smethwick,
May 29, 1897.

SMETHWICK GAS-WORKS.

CARBURETTING OIL.

THE Gas Committee invite Tenders for the supply of their requirements during the Year ending the 30th of June, 1898, of CARBURETTING OIL, ·680 Specific Gravity, delivered in Barrels at the Gas-Works, Rabone Lane, Smethwick.
Tenders, addressed to the Chairman, and endorsed "Tender for Oil," to be delivered to the undersigned not later than the 15th of June, 1897.
The Committee do not bind themselves to accept the lowest or any tender.

By order,
W. J. STURGES,
Secretary.

Public Buildings, Smethwick,
May 29, 1897.

CORRUGATED IRON ROOF.

THE Salisbury Gas Company are open to receive TENDERS for the supply and erection of a CORRUGATED IRON ROOF, about 70 feet span and 50 feet long.
Drawings and Specification may be inspected on application to the Engineer, Mr. N. H. Humphry, Gas-Works, Salisbury.
Tenders must be delivered on or before June 15.

LEYLAND AND FARINGTON GAS COMPANY, LEYLAND, NEAR PRESTON.

GAS COAL.

THE Directors of the Leyland and Farington Gas Company are prepared to receive TENDERS for their supply of COALS for the next Twelve Months.
Quantity used, about 2000 Tons Coal, and 500 Tons Cannel.
Tenders, endorsed "Gas Coal," to be in by Monday the 14th of June.
No special form of tender supplied.

CHARLES ELLIOTT,
Secretary.

Leyland, Lancs.,
June 2, 1897.

LEYLAND AND FARINGTON GAS COMPANY, LEYLAND, NEAR PRESTON.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Leyland and Farington Gas Company are prepared to receive TENDERS for the surplus TAR and LIQUOR produced at their Works during the next Twelve Months. Quantity made, about 150 Tons of Tar and 400 Tons of Liquor. Delivered free on Rails in Contractors' Tanks.
Tenders, endorsed "Tar and Liquor," to be in by Monday, the 14th of June.

CHARLES ELLIOTT,
Secretary.

Leyland, Lancs.,
June 2, 1897.

NEWARK GAS COMPANY.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Directors of the above Company are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR produced at their Works for One Year from the 1st day of July, 1897, at per degree Twaddel (Temperature 60° Fahr.). The Liquor to be not less than 5° in strength.
Terms: Cash monthly.
Further Particulars can be had on application to the undersigned, to whom sealed tenders, marked on the outside "Tender for Liquor," are to be sent on or before the 16th day of June next.
The highest tender will not be necessarily accepted.

F. B. FOOTTIT,
Secretary.

Newark, May 28, 1897.

NEWARK GAS COMPANY.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Newark Gas Company are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works, free on Rail G.N.R. or M.R., in Purchaser's Tanks, for One Year from the 1st day of July, 1897.
Terms: Cash monthly.
Further Particulars can be obtained on application to the undersigned, to whom sealed tenders are to be sent on or before the 16th day of June next, marked on the outside "Tender for Tar."
The Directors do not bind themselves to accept the highest or any tender.

By order,
F. B. FOOTTIT,
Secretary.

Newark, May 28, 1897.

BARKING GAS COMPANY.

TO BUILDERS AND CONTRACTORS.
CONTRACT NO. 1.

THE Directors of this Company invite TENDERS for the erection of a New RETORT-HOUSE (83 ft. long by 60 ft. wide inside measure), a BOILER-HOUSE, EXHAUSTER HOUSE, and MESS-ROOM on their Premises at Barking, Essex.
Drawings and Specification may be seen at the Company's Office, 55, High Holborn, London, or on application to Mr. W. North, at the Gas-Works, Stourbridge, on and after Thursday, June 3, 1897.
Sealed tenders, endorsed "Tender for Retort-House," and addressed to the Secretary of the Barking Gas Company, 55, High Holborn, London, must be sent in on or before Thursday, June 17, 1897.

STUART MORRIS,
Secretary.

55, High Holborn, London, W.C.,
May 27, 1897.

BARKING GAS COMPANY.

TO WROUGHT-IRON ROOF MAKERS.
CONTRACT NO. 2.

THE Directors invite Tenders for a new WROUGHT-IRON ROOF to cover their new Retort-House, to be erected on their Premises at Barking, Essex. The Retort-House will be 83 ft. long by 60 ft. wide inside measure.
Drawings and Specification may be seen at the Company's Office, 55, High Holborn, London, or on application to Mr. W. North, at the Gas-Works, Stourbridge, on and after Thursday, June 3, 1897.
Sealed tenders, endorsed "Tender for Iron Roof," and addressed to the Secretary of the Barking Gas Company, 55, High Holborn, London, must be sent in on or before Thursday, the 17th day of June, 1897.

STUART MORRIS,
Secretary.

55, High Holborn, London, W.C.,
May 27, 1897.

THE Corporation of Middleton are prepared to receive TENDERS for a quantity of COAL and CANNEL, to be delivered at the Middleton Railway Station.

Further Particulars and Form of Tender may be obtained from Mr. Duxbury, Gas Manager.

Tenders, addressed to the Chairman of the Gas Committee, to be delivered at my Office on or before Wednesday, the 16th day of June, 1897, endorsed "Tender for Coal or Cannel," as the case may be.

The Corporation do not bind themselves to accept the lowest or any tender.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton,
Near Manchester, June 2, 1897.

TENDERS FOR GAS COAL.

THE Directors of the Newmarket Gas Company are prepared to receive TENDERS for the supply of 4500 Tons of best screened GAS COAL during the ensuing Twelve Months ending June 30, 1898.

Tenders, stating Price per ton, delivered free at Newmarket Station as required, to be sent, on or before the 19th inst., to the undersigned, from whom any further Particulars may be obtained.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
J. H. TROUGHTON,
Manager and Secretary.

Gas-Works, Newmarket,
June 4, 1897.

MILLOM URBAN DISTRICT COUNCIL.

TENDERS are invited for the supply of from 1600 to 2000 Tons of GAS COAL at such times and in such quantities as the Council may require during Twelve Months from the 1st of July next. The Coal must be of the best quality. Full Particulars of Coal, Colliery, and Working Analysis to be given.

State Price per ton delivered free at Millom Station, and (where applicable) at the nearest Port to Colliery or Depôt.

Sealed tenders on forms (which can be had on application), endorsed "Tender for Coal," to be sent in to me not later than the 20th inst.

The Council will not be bound to accept the lowest or any tender.

W. T. LAWRENCE,
Clerk.

Millom, June 3, 1897.

TENDERS FOR GAS COAL.

THE Gas Committee of the Carnarvon Corporation invite TENDERS for the supply of 2000 Tons of best screened GAS COAL and 200 Tons of screened CANNEL, to be delivered free, as required, in Trucks on the Gas-Works Siding, Carnarvon, during the Twelve Months ending the 31st of August, 1898.

Sealed tenders, endorsed "Tender for Coal," and addressed to the Chairman of the Gas Committee, Guildhall, Carnarvon, to be delivered on or before Monday, the 21st inst.

The Committee reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any tender.

Forms of Tender and Specification may be had on application to the undersigned.

HARRY D. DUESBURY,
Manager.

Gas Office, Carnarvon,
June 4, 1897.

SUTTON, SOUTHCOATES, AND DRYPOOL GAS COMPANY (INCORPORATED), HULL,

INVITE Tenders for the surplus Tar, also for the whole of the AMMONIACAL LIQUOR produced at their Works, at per ton over the Company's Weighing-Machine, from the 1st of July, 1897, to the 30th of June, 1898, both inclusive.

Probable quantity of Tar, 900 Tons.
Do. Ammoniacal Liquor, 1100 Tons.

Both Tar and Ammoniacal Liquor to be taken from the Company's elevated Tank into Contractor's Carts which must be supplied as required by the Vendors.

Tenders for Ammoniacal Liquor must state price per degree Twaddell's Hydrometer, from 4° to 8°.

Further Particulars may be obtained of the Manager at the Gas-Works, St. Mark's Street.

Tenders to be sent to the undersigned on or before the 28th of June, 1897, endorsed "Tender for Tar or Liquor."

The Company do not bind themselves to accept the highest or any tender.

DAVID WOOD,
Secretary.

Offices: St. Mark's Street, Hull,
June 4, 1897.

COUNTY BOROUGH OF BURY.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Corporation are prepared to receive TENDERS for the supply, for One, Two or Three Years, of

3000 Tons of CANNEL per annum.
30,000 Tons of GAS COAL per annum.
500 Tons of BURGY per annum.
200 Tons of HOUSE COAL per annum.

The same to be delivered in such quantities and at such times as the Gas Engineer of the Corporation may from time to time order.

Printed Forms of Tender and Conditions of Contract may be obtained on application to Mr. W. H. S. Gendall, Engineer, Gas-Works, Bury.

Tenders, which must be on the printed Forms, and addressed to the Chairman of the Gas Committee, Town Clerk's Office, Bury, marked "Tender for Gas Coal," to be delivered not later than the 17th of June, 1897.

Preference will be given to those persons or firms who pay to their workpeople the regular Standard Rate of Wages obtaining at the time in the Town or District.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bury,
May 27, 1897.

THE INCORPORATED

Gas Institute.

THE THIRTY-FOURTH

ANNUAL GENERAL MEETING

OF THE MEMBERS

WILL BE HELD ON

Tuesday, Wednesday, and Thursday,

the 15th, 16th, and 17th of June, 1897,

AT THE

GUILDHALL, BATH.

THE CHAIR WILL BE TAKEN BY THE PRESIDENT,

C. STAFFORD ELLERY, Esq.

The Proceedings on Tuesday commence at 11 a.m., when a welcome will be extended by his Worship the Mayor of Bath, George Woodiwiss, Esq., J.P. On Wednesday and Thursday, the chair will be taken at 10 a.m.

On Friday, June 18, there will be an Excursion by brake to Longleat Park, the seat of the Marquess of Bath.

THE BENEVOLENT FUND.

The Annual General Meeting of the Donors and Subscribers to the Benevolent Fund will be held on Tuesday, June 15, at the close of the sitting, about 4.30 p.m.

WALTER T. DUNN, Secretary.

13, *Victoria Street, Westminster S.W.*

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for about 300 Tons of SPENT OXIDE at their Regent Road and Bloom Street Works.

Full Particulars of the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed tenders, endorsed "Tender for Spent Oxide," to be delivered to me not later than Five p.m. on Thursday, the 17th inst., addressed to the Chairman of the Gas Committee.

By order,
SAML. BROWN, Town Clerk.

Town Hall, Salford,
June 2, 1897.

ROCHESTER, CHATHAM, AND STROOD GAS-LIGHT COMPANY.

TAR.

THE Directors are prepared to receive TENDERS for the purchase of the surplus TAR, to be produced at their Works at Rochester and Gillingham for One Year, commencing the 1st of July next.

The quantity will be about 300,000 Gallons.

Further Particulars, with Form of Tender and Contract, may be had on application.

Sealed tenders, endorsed "Tar," must be delivered to me, at these Offices, not later than Noon of Thursday, the 17th of June, 1897.

The Directors do not undertake to accept any tender; and security for due fulfilment of the contract must be given if required.

J. M. VEEVERS,
Engineer and General Manager.

Gas Offices: 95, High Street, Rochester,
June 3, 1897.

MANCHESTER CORPORATION GAS-WORKS.

SPENT OXIDE.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the purchase and immediate removal of about 200 Tons of SPENT OXIDE, now lying at the Gaythorn Gas-Works.

The Committee do not bind themselves to accept the highest or any tender.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Spent Oxide," must be delivered at the Offices of the Gas Department not later than Ten a.m. on Friday, the 18th inst.

Forms of Tender and Samples of the Oxide from bulk may be obtained on application to Mr. Charles Nickson, Superintendent of the Gas Department.

By order,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
June 4, 1897.

SCARBOROUGH GAS COMPANY.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Scarborough Gas Company invite TENDERS for the surplus TAR and the whole of the AMMONIACAL LIQUOR to be produced at their Works for One or more Years from the 1st day of July next.

Tenders for Liquor may be submitted either at a fixed price per ton or on a Sliding-Scale, regulated by the price of Sulphate. Preference will, however, be given to the latter.

Further Particulars may be obtained on application to the undersigned, to whom sealed tenders (duly endorsed) must be delivered not later than noon, on Saturday, the 12th of June next.

The Directors do not bind themselves to accept the highest or any tender.

By order of the Board,
(Signed) J. HOLLIDAY,
Engineer and Secretary.

Gas Offices: 32, Westborough,
Scarborough, May 19, 1897.

THE Urban District Council of Hindley are prepared to receive TENDERS for the supply of GAS COAL, CANNEL, ENGINE SLACK, and LIME required at their Gas-Works during the ensuing Twelve Months, and also for the purchase of the TAR and AMMONIACAL LIQUOR produced at their Gas-Works during the ensuing Twelve Months.

Full Particulars, with Forms of Tender, can be obtained on application to Mr. Wm. Dickinson, Gas and Water Manager.

Sealed tenders, endorsed "Tender for Gas Coal, &c.," to be lodged with the undersigned not later than Monday, June 14, 1897.

By order,
STEPHEN HOLT,
Clerk to the Council.

Offices: Cross Street, Hindley,
June 2, 1897.

YSTRAD GAS AND WATER COMPANY.

TENDERS are invited for the following—

1. COAL—Supply of Gas Coal to the Ystrad and Porth Gas-Works for Twelve Months ending the 30th day of June, 1898.
2. LIME—Supply of Lime for Gas Purification to the Ystrad and Porth Gas-Works for Twelve Months ending the 30th day of June, 1898.
3. TAR—Purchase of surplus Tar made at the Ystrad and Porth Gas-Works for Twelve Months ending the 30th day of June, 1898.

Specifications and Particulars can be had on application to Mr. A. R. Cawley, General Manager, Gas and Water Offices, Pentre R.S.O., Glam.

Sealed tenders to be sent to the undersigned on or before the 17th inst.

ARTHUR P. JAMES,
Secretary.

123, Queen Street, Cardiff,
June 1, 1897.

THE Corporation of the City of Bangor are prepared to receive TENDERS for the GAS COAL required at their Gas-Works during the ensuing Year, in such quantities and at such times as may be required (in all 4000 Tons) from the 1st of September, 1897, to the 31st of August, 1898.

The person whose tender is accepted will be required to enter into an Agreement with the Council for the due performance of his contract.

The lowest or any tender not necessarily accepted. The Council also reserve the right to divide the contract between two or more Contractors.

Further Information and Forms on which the tenders must be made may be obtained on application to the undersigned.

Sealed tenders, addressed to the Chairman of the Lighting Committee, must be delivered on or before the 21st inst.

JOHN SMITH,
Manager.

Gas-Works, Bangor,
June 1, 1897.

BRIDGNORTH CORPORATION GAS-WORKS.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee are prepared to receive sealed TENDERS for the supply of GAS COAL, including carriage to the Bridgnorth Railway Station, for One Year from or soon after the end of July next.

Evidence as to the quality of the Coal must accompany each Tender.

Quantity required: About 200 Tons per annum in proportionate deliveries as directed—say, 70 per cent. during Winter Months, and 30 per cent. during Summer Months.

Sealed and marked tenders must be sent to the undersigned not later than Saturday, the 12th of June.

The Committee do not bind themselves to accept the lowest or any tender.

By order,
J. H. COOKSEY, Town Clerk,
Secretary.

Bridgnorth, May 26, 1897.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shrewsbury Gas-light Company invite TENDERS for the supply of about 12,000 Tons of screened GAS COAL, to be delivered free at the Great Western or London and North-Western Goods Yard, Shrewsbury, during the Year commencing July 1, 1897, and ending June 30, 1898.

The Directors reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any tender.

Tenders must be made on Forms (containing further Particulars), which may be obtained on application at the Company's Works, or by post, and must be sent to the undersigned, on or before the 17th day of June, 1897.

By order,
WM. BELTON, Assoc.M.Inst.C.E.,
Secretary and Manager.

Gas-Works, Shrewsbury,
May 21, 1897.

CORPORATION OF LANCASTER.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee are prepared to receive TENDERS for the supply of screened GAS COAL, delivered on the Gas-Works Siding, Lancaster, in such quantities and at such times as may be required during a period of One Year, commencing delivery Sept. 1 next.

Sealed tenders, endorsed "Gas Coal," giving full Particulars of the Coal offered, must be delivered to T. Cann Hughes, Esq., Town Clerk, Lancaster, on or before the 19th inst.

Forms of Tender may be obtained on application to the undersigned.

The lowest or any tender not necessarily accepted.

C. ARMITAGE,

Gas-Works, Lancaster,
June 1, 1897.

CONTRACT FOR GAS COAL.

NOTICE is Hereby Given, that the Urban District Council of Horncastle, in the County of Lincoln, are prepared to receive TENDERS for the supply of from 500 to 1900 Tons (Railway weight) of best screened SILKSTONE GAS COAL and GAS NUTS, to be delivered by the 30th of June, 1898, in such quantities, and at such times, as the Council may direct. The Coal to be sent in a dry condition, free from Hards, Smudge, Dirt, Shale, Pyrites, or other Impurities.

Sealed tenders, marked "Tender for Gas Coal," to be sent to the Clerk to the Council, on or before the 15th day of June, 1897.

The Council do not bind themselves to accept the lowest or any tender.

By order,
S. GOE OVERTON,
Clerk to the Council.

2, Manor House Street,
Horncastle, May 27, 1897.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

SALE BY AUCTION OF £15,000 OF FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY AUCTION at the Mart, Tokenhouse Yard, London, on the 5th day of July next, £15,000 of £4 PER CENT. PERPETUAL DEBENTURE STOCK, in accordance with the Provisions of the Tottenham and Edmonton Gas Act, 1882.

The Stock must be paid up in full on or before the 31st day of July next, after which date Interest will commence to accrue on such Stock, to be payable by Warrant on the 1st day of January and the 1st day of July in each year.

Particulars and Conditions of Sale may be obtained on application at the Offices of the Company; of Messrs. Merriman, Pike, and Merriman, 21, Austin Friars, E.C., Solicitors; or of Mr. Alfred Richards, Auctioneer, 816, High Road, Tottenham, and 18, Finsbury Circus, London.

By order,
JAMES RANDALL,
Secretary.

Offices: Willoughby Lane,
Tottenham, June 4, 1897.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS in respect both to the FOUR-AND-A-HALF PER CENT. and THREE PER CENT. DEBENTURE STOCKS WILL BE CLOSED on the 14th of June inst. and RE-OPENED on the 1st of July, 1897.

By order,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place, Bishopsgate, E.C.,
June 5, 1897.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to DEBENTURE STOCKS and BONDS, WILL BE CLOSED at Four o'clock p.m. on Thursday, the 10th inst., for the Half Year ending on the 30th inst., and will be RE-OPENED on the morning of Friday, the 11th inst.

The Interest for the Half Year will be payable on the 1st of July next to the Proprietors registered on the closing of the Books.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., June 1, 1897.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Power.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

BY EDWIN FOX AND BOUSFIELD,
AT THE AUCTION MART, ON
WEDNESDAY, JUNE 16, AT TWO, IN LOTS.
THE NEW RIVER.

UNQUESTIONABLY the choicest Home Investment of this or any other age.—Important FREEHOLD ESTATES, comprising parts of an Adventurer's Share and parts of a King's Share in the New River. The Dividend for the Year ending Christmas last was over £2700 per Share; having risen from £1136 in a little over 25 Years, the Revenue of the Company derived from Land and Water having advanced during that time from £284,203 to £562,996 per annum, and is without limit as to future Accretions, occasional Bonuses, an important Reversion to a large and increasing Income, and to a share of the Landed and other Properties, notably that in Clerkenwell, extending over 50 acres, covered with Buildings, the Leases of which begin to fall in in 1903, when the rack-rentals come into possession. Also

TWENTY-TWO £100 NEW FULLY-PAID SHARES, the Dividend last Year being about 12½ per cent. on each Share. Also

£5000 THREE PER CENT. DEBENTURE STOCK, with Interest payable the 1st of August and the 1st of February.

Particulars at Messrs. EDWIN FOX AND BOUSFIELD'S Office, 99, Gresham Street, BANK, E.C.; and of the Vendor's Solicitors, Messrs. BERRIDGE AND SONS, LEICESTER; Messrs. FRY AND HUDSON, Nos. 5 and 6, MARK LANE, E.C.; and of Messrs. GASQUET AND METCALFE, 92, GREAT TOWER STREET, E.C.

Price 6s., Cloth Bound,

THE CHEMISTRY OF ILLUMINATING GAS.

By N. H. HUMPHRYS, Assoc M.Inst.C.E., F.C.S.

LONDON:
WALTER KING, 11, Bolt Court, Fleet Street, E.C.

EXTRACTION APPARATUS

SPECIALLY DESIGNED

TO EXTRACT THE SULPHUR FROM SPENT OXIDE.

BUILT BY

WEGELIN & HÜBNER, HALLE a/S.

ENGINEERS AND IRONFOUNDERS.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

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DALKEITH, N.B.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

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STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
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ANVILS, VICES,
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90, CANNON STREET, E.C.

GAS ILLUMINATION JUBILEE DEVICES.

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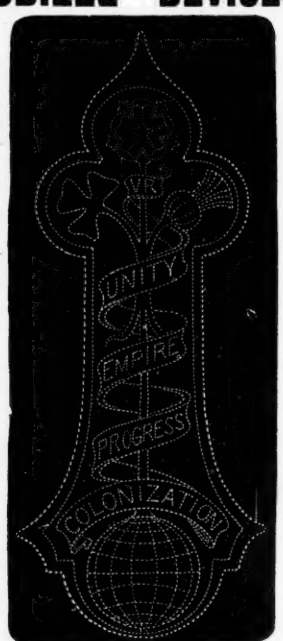

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— LIMITED —
EDINBURGH, LONDON, LEEDS AND GLASGOW.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

EVESON FOR CANNEL

TELEGRAMS:
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PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

THE "COOMBE" DRAUGHT SCREEN FOR INCANDESCENT BURNERS.

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BIRMINGHAM.

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FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

Price 7s. 6d. per 100; £3 *per* 1000 (*Carriage Free*), *Demy 4to.*,
A LEAFLET ON

SULPHATE OF AMMONIA:

ITS SOURCE—RELATIONSHIP TO SOIL—EFFECT ON PLANTS.

BY

H. H. COUSINS, M.A., South-Eastern Agricultural College, Wye.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

BOWENS' Ltd. Successors, STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.

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The Climax of Regenerative Gas Lighting!!

THE
"VERTMARCHE"
A 280-CANDLE POWER
PLAIN IRON LAMP,
CLASS A— **55/-**

LIGHT for LIGHT less than half the price of any other Regenerative Lamp.

Manufactured in England.

HENRY GREENE & SONS,

153 & 155, CANNON STREET,
LONDON BRIDGE, E.C.

PARTICULARS AND PRICES FREE. AGENTS WANTED.

ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,
GLASGOW.

[See Illustrated Advertisement, June 1, p. 1267.]

HUTCHINSON BROTHERS.

GAS ENGINEERS, &c.,

MANUFACTURERS OF IMPROVED

WET AND DRY GAS-METERS.

STATION-METERS. LAMP-METERS.

TEST GASHOLDERS & GENERAL GAS APPARATUS.

BRASS MAIN AND LAMP TAPS.

UNIONS, FERRULES, ETC.

The "Falcon" Lamplighter's Torch. Service Cleaners.

SYPHON AND OTHER PUMPS.

Wood and Wrought-Iron Purifier-Grids. Scrubber Boards.

WET AND DRY METERS REPAIRED.

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Telegrams: "HUTCHINSON BROS., BARNSLEY.

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ROBERT MARSHALL,
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97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

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Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

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WORKED BY THE
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OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton	10,500	Cub. Ft.
Illuminating Power	16·9	Candles.
Coke (of good quality)	67·5	per Cent.
Sulphur	0·58	,,
Ash	2·73	,,

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QUAYSIDE, NEWCASTLE-ON-TYNE.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
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TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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COMBINES HIGH ILLUMINATING POWER and GREAT ECONOMY OF GAS with a SOFT, PLEASANT LIGHT.

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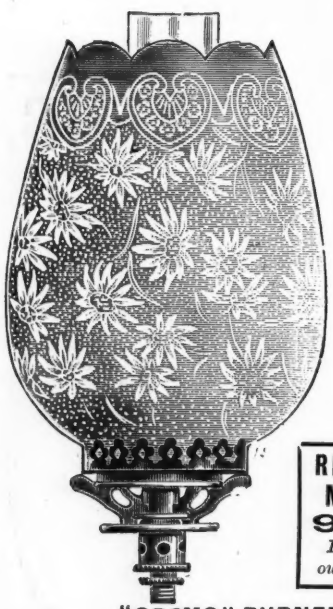
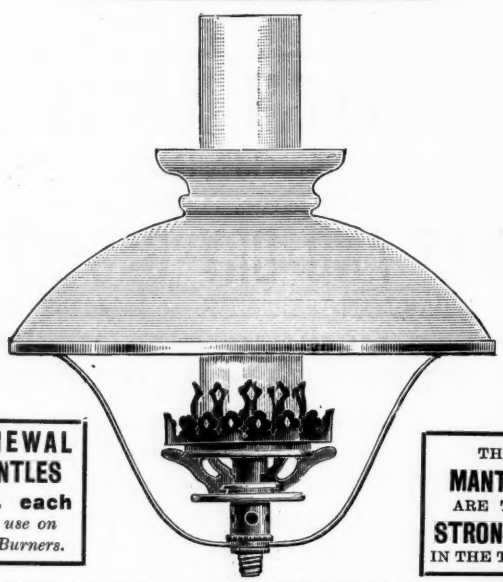
THE IDEAL LIGHT FOR DOMESTIC USE.

Price from **5/3** Complete.



RENEWAL MANTLES 9d. each *For use on our Burners.*



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Every Description of ORDINARY GAS-METERS.

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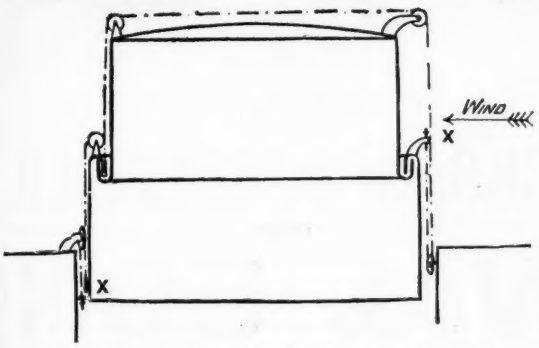

ONE $\frac{3}{4}$-inch Steel Cable in Double Purchase has a controlling power of **60 TONS**

WIND at 30 lbs. per foot has an overturning power of less than **9 TONS**
in the case of an Holder of Two Lifts, 100 ft. by 20 ft.

A Gasholder on the Cable System can rely on a support which is exactly known in amount, is direct and simple in application, and is exerted through the strongest parts of the framework only.

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N.B.—If the holder were always at one height, the Cables might be fastened at XX. *The support that the Holder derives from the Cables is equally perfect, notwithstanding its rise and fall.*

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Applicable to existing Lamps.

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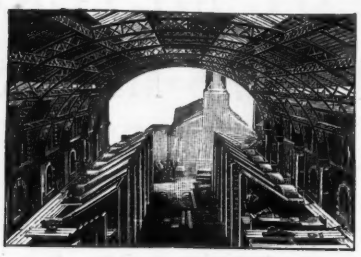

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Telegrams:
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PATENT SCRUBBER-WASHERS,
All sizes,
From 50,000 to 5,000,000 Cubic Feet of Gas per day.
Results unrivalled. Send for Particulars and Prices.

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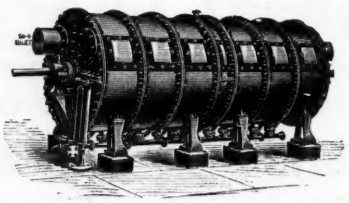

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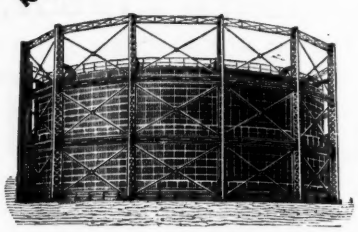

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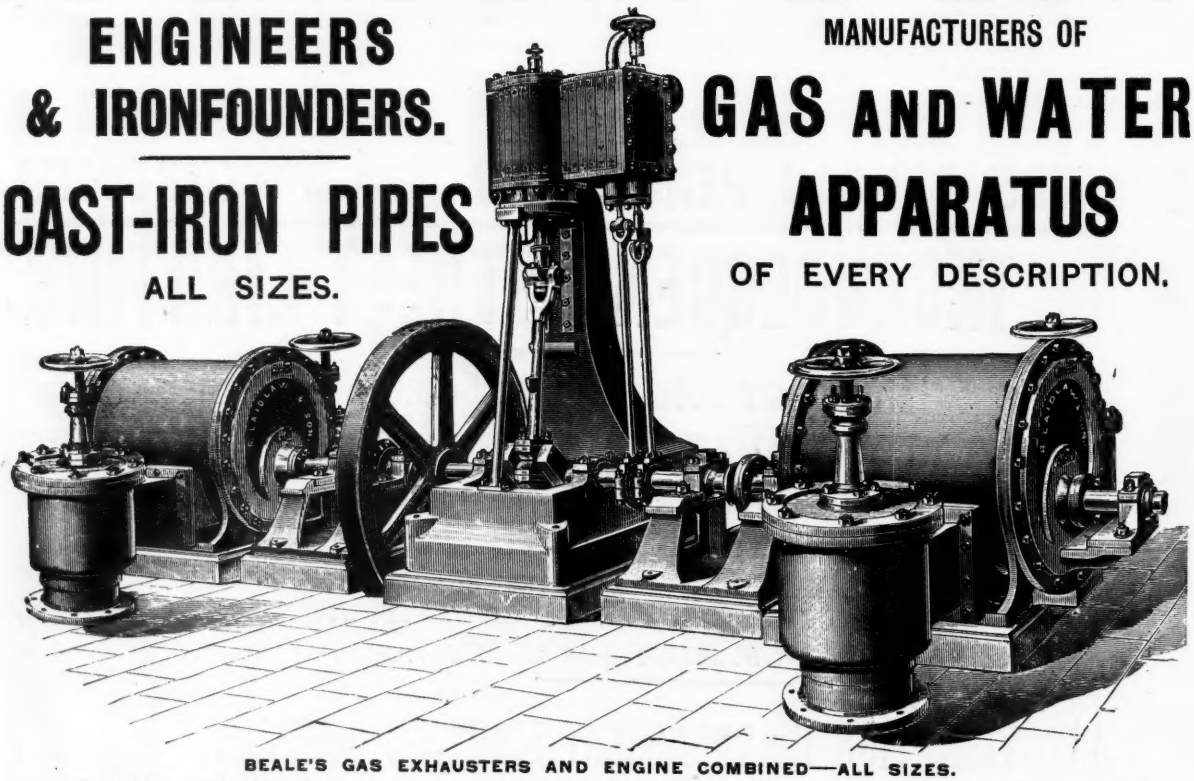

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VERY FREE FROM IMPURITIES.

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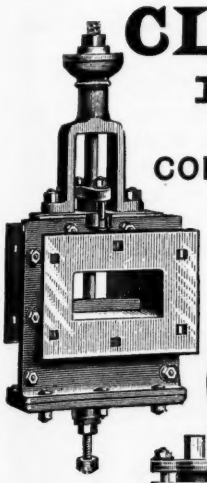
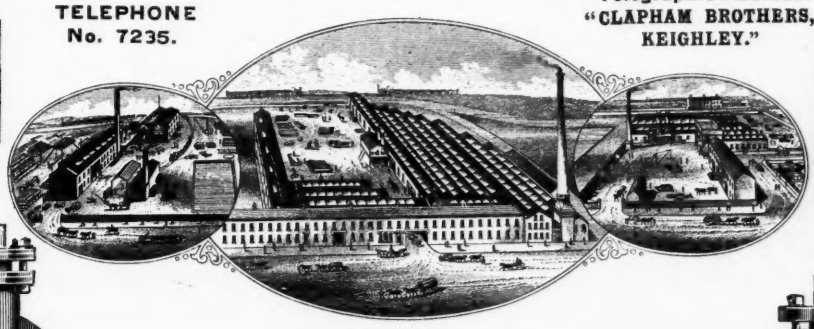
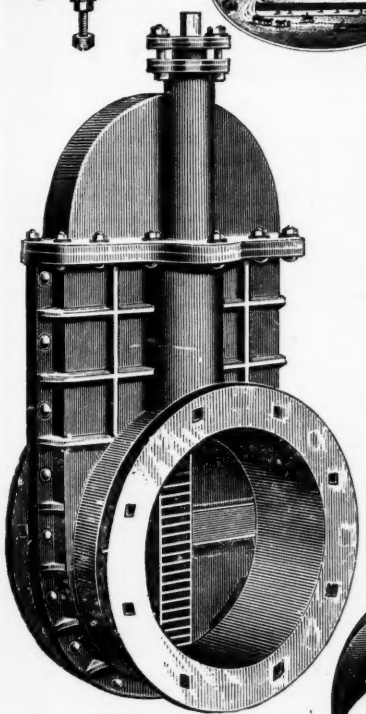
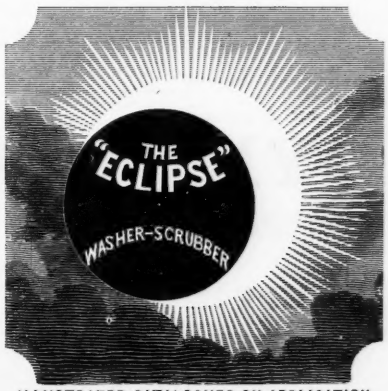


TELEPHONE No. 7235.

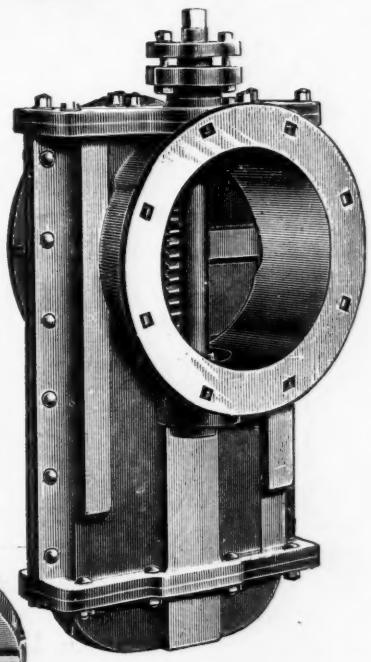
Telegraphic Address: "CLAPHAM BROTHERS, KEIGHLEY."

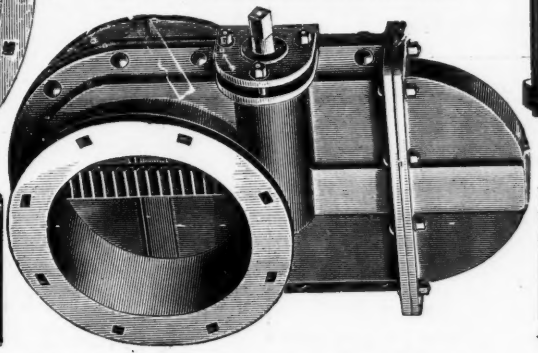






ILLUSTRATED CATALOGUES ON APPLICATION.





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it quite **supersedes** the familar three-light pendent. We are able to bear witness to the **convenience** of the New Pendant."

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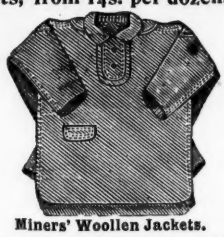
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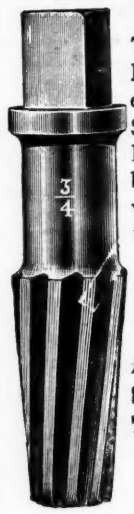

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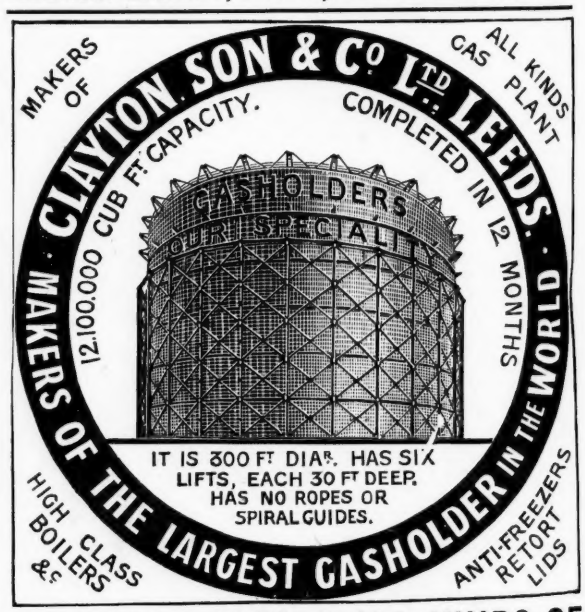
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SOCKET-PIPES FOR GAS OR WATER PURPOSES.

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The most successful and approved Apparatus known up to the present time.

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THIS SYSTEM HAS BEEN IN SUCCESSFUL OPERATION AT VARIOUS WORKS FOR SEVERAL YEARS, AND CAN BE SEEN BY APPOINTMENT.

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PATENT LIGHT-DIFFUSING GLOBE.

Guaranteed to give more Light, with better Diffusion, than any Globe in existence.

LATEST PATTERN No. 23.

No. 23. NEW EYECUP for "C" Incandescent Burner.

Diameter 5 inches. Height 3½ inches.

IN CRYSTAL 24s. PER DOZEN. IN NEW PATENT ROSE TINT 36s. PER DOZEN.

SPECIAL PATTERNS FOR ARC, INCANDESCENT GAS "C" BURNERS, AND OIL-LAMPS.

Dr. DREHSCHMIDT, of Berlin, has recently made exhaustive tests with the latest "Holophane" Patent Light-Diffusing Globes, when used with Incandescent Gas-Burners, and has proved conclusively that, below the horizontal, the "Holophane" gives an average of 29 per cent. more light than the bare Incandescent Burner; and at angles below 45°

OVER **100** PER CENT. MORE THAN THE BARE LIGHT.

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Manufacture & supply best quality of

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